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BLIND MAN'S LANTERN

by Allen Kim Lang

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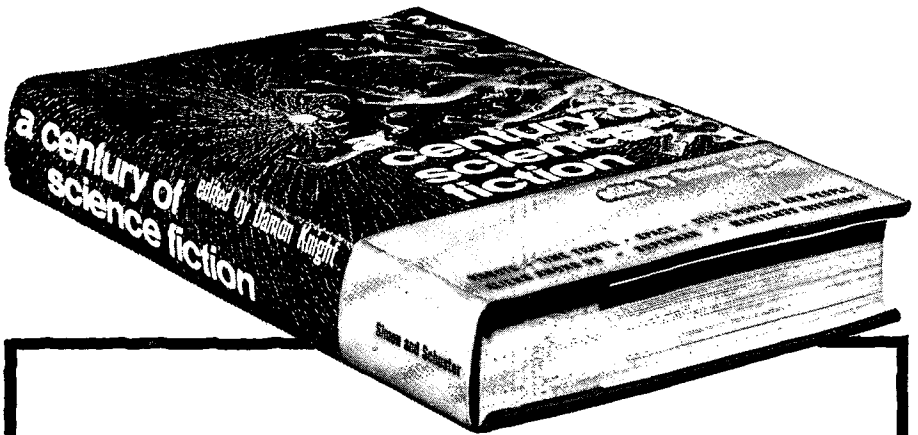

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In the name of Science

■ Among the unnumbered Lincoln stories, there is the story that someone once asked him, "If you call a dog's tail a leg, how many legs has a dog got?" to which Lincoln is supposed to have replied, "Four. Calling a dog's tail a leg doesn't make it one."

And calling activity associated with laboratories, computing machines and learned societies "Science" doesn't make it one. The problem I've been trying to call attention to in the last months appears, from letters and conversations with readers, to need sharper definition than I've given it.

I think that the primary problem is to define the "Scientific Method"—and that needs both inclusive and exclusive definition.

The true, disciplined, highly thoughtful Mystic is not a scientist, however cogent and valid his thought. A pure mathematician is not a Scientist, either, however sound his mathematical researches. Euclid was not a scientist, however sound and valuable and logical his work was. Albert Einstein, *per se, as himself alone*, was *not* a scientist; he was a philosopher, a theoretician, but he *himself* did not practice the Scientific Method.

The Greeks of Athenian times rejected experimental test of theories as a matter of high and noble principle; they specifically held that experimental procedures were improper. Only theoretical-logical reasoning was proper for an educated gentleman.

The Romans were among the world's greatest engineers; they had small respect for a mere theorist, and held that theory was of no use to a man with a job to get done.

Neither the Greeks nor the Romans, then, were Scientists in the sense defined by the Scientific Method. The Greeks had theory, and despised experiment; the Romans had hard-headed, pragmatic engineering, and demeaned theory. Each had half of the structure—but it was the Islamic philosophers who first consciously, specifically, and as a matter of expressed philosophy, put the two factors together as a meshing whole.

The essentials of the true Scientific Method are:

1. An hypothesis—a postulate—is invented. This is *not* a logi-

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cal step; it can not be derived by any logical procedure, the method of arriving at it can neither be expressed in modern language, nor defended in any accepted terminology. It's "intuitively true" concepts.

2. The new hypothesis is interacted with previously derived data, previously accepted hypotheses—which, because they have been accepted widely and usefully are called "Laws" or "Theorems"—and logical-mathematical conclusions concerning the consequences of the new postulate derived.

   The steps this far are true for the Pure Mystic, the Pure Theoretician, and the Pure Mathematician as well as for the Scientist.

3. The various consequences of the new hypothesis are studied, and one or more selected and compared with previously derived consequences of previous theories. A point of conflict is found—where the new theory predicts that A must happen, while previous theory holds that B will.

4. The Scientist then arranges the experimental conditions required, and the point of disagreement between the theories is tested by experiment. If A occurs, and B does not, then the new theory is considered to have been verified, and the old theory is now strongly suspect.

   This step—the deliberate experimental test of theory—is the thing that distinguishes the Scientist from the Mystic or Pure Theoretician.

   The concept that the best and noblest and most beloved of theories must yield to a mere physical experiment, is the hard, and hard-to-take discipline that distinguishes the Scientist from the Logician-Mystic-Theorist. The Scientist *must yield his theory to experiment*. The mystic, the mathematician, need not.

A moment out for discussion at this point: a Mystic, a Pure Theoretician, (*Continued on page 172*)

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Blind Man's Lantern

Successful colonies among the stars require interstellar ships—but they require, also, a very special kind of man. A kind you might not think to look for...

Allen Kim Lang

Illustrated by Schelling

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Walking home in the dark from an evening spent in mischief, a young man spied coming toward him down the road a person with a lamp. When the wayfarers drew abreast, the playboy saw that the other traveler was the Blind Man from his village. "Blind Man," the youngster shouted across the road, "what a fool you be! Why, old No-Eyes, do you bear a lantern, you whose midnight is no darker than his noonday?" The Blind Man lifted his lamp. "It is not as a light for myself that I carry this, Boy," he said, "it is to warn off you fools with eyes."

—Hausa proverb

The Captain shook hands with the black-hatted Amishman while the woman stood aside, not concerning herself with men's business. "It's been a pleasure to have you and *Fraa* Stoltzfoos aboard, Aaron," the Captain said. "Ship's stores are yours, my friend; if there's anything you need, take it and welcome. You're a long way from the corner grocery."

"My Martha and I have all that's needful," Aaron Stoltzfoos said. "We have our plow, our seed, our land. Captain, please tell your men, who treated us strangers as honored guests, we thank them from our hearts. We'll not soon forget their kindness."

"I'll tell them," the Captain promised. Stoltzfoos hoisted himself to the wagon seat and reached a hand down to boost his wife up beside him. Martha Stoltzfoos sat, blushing a bit for having displayed an accidental inch of black stocking before the ship's officers. She smoothed down her black skirts and apron, patted the candle-snuffer *Kapp* into place over her prayer-covering, and tucked the wool cape around her arms and shoulders. The world outside, her husband said, was a cold one.

Now in the Stoltzfoos wagon was the final lot of homestead goods with which these two Amishers would battle the world of Murna. There was the plow and bags of seed, two crates of nervous chickens; a huge, round tabletop; an alcohol-burning laboratory incubator, bottles of agar-powder, and a pressure cooker that could can vegetables as readily as it could autoclave culture-media. There was a microscope designed to work by lamplight, as the worldly vanity of electric light would ill suit an Old Order bacteriologist like Martha Stoltzfoos. Walled in by all this gear was another passenger due to debark on Murna, snuffling and grunting with impatience. "*Sei schtill,* Wutzchen," Stoltzfoos crooned. "You'll be in your home pen soon enough."

The Captain raised his hand. The Engineer punched a button to tongue the landing ramp out to Murnan earth. Cold air rammed in from the outside winter. The four horses stomped their hoofs on the floorplates, their breath spikes of steam. Wutzchen squealed dismay as the chill hit his nose.

"We're *reddi far geh,* Captain," Stoltzfoos said. "My woman and I invite you and your men to feast at our table when you're back in these parts, five years hence. We'll stuff you fat as

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sausages with onion soup and Pannhaas, Knepp and Ebbelkuche, shoofly pie and *scharifer* cider, if the folk here grow apples fit for squeezing."

"You'll have to set up planks outdoors to feed the lot I'll be bringing, Aaron," the Captain said. "Come five-years' springtime, when I bring your Amish neighbors out, I'll not forget to have in my pockets a toot of candy for the little Stoltzes I'll expect to see underfoot." Martha, whose English was rusty, blushed none the less. Aaron grinned as he slapped the reins over the rumps of his team. "Gid-dap!" The cart rumbled across the deck and down the ramp, onto the soil of Murna. Yonnie, the Ayrshire bull, tossed his head and sat as the rope tightened on his noseband. He skidded stubbornly down the ramp till he felt cold earth against his rear. Accepting fate, Yonnie scrambled up and plodded after the wagon. As the Stoltzfooses and the last of their off-worldly goods topped a hillock, they both turned to wave at the ship's officers. Then, veiled by the dusty fall of snow, they disappeared.

"I don't envy them," the Engineer said, staring out into the wintery world.

"Hymie, were you born in a barn?" the Exec bellowed.

"Sorry, sir." The Engineer raised the landing ramp. Heaters hummed to thaw the hold's air. "I was thinking about how alone those two folks are now."

"Hardly alone," the Captain said. "There are four million Murnans, friendly people who consider a white skin no more than a personal idiosyncrasy. Aaron's what his folks call a *Chentelmaan,* too. He'll get along."

"Chentelmaan-schmentelmaan," the Engineer said. "Why'd he come half across Creation to scratch out a living with a horse-drawn plow?"

"He came out here for dirt," the Captain said. "Soil is more than seedbed to the Amish. It feeds the Old Order they're born to. Aaron and Martha Stoltzfoos would rather have built their barns beside the Susquehanna, but all the land there's taken. Aaron could have taken a job in Lancaster, too; he could have shaved off his beard, bought a Chevie and moved to the suburbs, and settled down to read an English-language Bible in a steepled church. Instead, he signed a homestead-contract for a hundred acres eighty light-years from home; and set out to plow the land like his grandpop did. He'll sweat hard for his piece of Murna, but the Amish always pay well for their land."

"And what do we, the government, I mean, get from the deal?" the Exec wanted to know. "This wagon of ours doesn't run on hay, like Aaron's does."

"Cultures skid backwards when they're transplanted," the Captain said. "Murnan culture was lifted from Kano, a modern city by the standards of the time; but, without tools and with a population too small to support technology, the West African apostates from Islam who landed here four hundred years ago slid back to the ways of their grandparents. We want them to get up to date again.

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We want Murna to become a market. That's Aaron's job. Our Amishman has got to start this planet back toward the machine age."

"Seems an odd job to give a fellow who won't drive a car or read by electric light," the Engineer observed.

"Not so odd," the Captain said. "The Amish pretty much invented American agriculture, you know. They've developed the finest low-energy farming there is. Clover-growing, crop-rotation, using animal manures, those are their inventions. Aaron, by his example, will teach the natives here Pennsylvania farming. Before you can say Tom Malthus, there'll be steel cities in this wilderness, filled with citizens eager to open charge accounts for low-gravs and stereo sets."

"You expect our bearded friend to reap quite a harvest, Captain," the Engineer said. "I just hope the natives here let him plant the seed."

"Did you get along with him, Hymie?"

"Sure," the Engineer said. "Aaron even made our smiths, those human sharks bound for Qureysh, act friendly. For all his strange ways, he's a nice guy."

"Nice guy, hell," the Captain said. "He's a genius. That seventeenth-century un-scientist has more feeling for folkways in his calloused left hand than you'd find in all the Colonial Survey. How do you suppose the Old Order maintains itself in Pennsylvania, a tiny Deitsch-speaking enclave surrounded by calico suburbs and ten-lane highways? They mind their business and leave the neighbors to theirs. The Amish have never been missionaries—they learned in 1600 that missionaries are resented, and either slaughtered or absorbed."

"Sometimes digestively," the Engineer remarked.

"Since the Thirty Years' War, back when 'Hamlet' was opening in London, these people have been breeding a man who can fit one special niche in society. The failures were killed in the early days, or later went gay and took the trappings of the majority. The successes stayed on the farm, respected and left alone. Aaron has flirted with our century; he and his wife learned some very un-Amish skills at the Homestead School. The skill that makes Aaron worth his fare out here, though, is an Amish skill, and the rarest one of all. He knows the Right Way to Live, and lives it; but he knows, too, that your Truth-of-the Universe is something different. And right, for you. He's quite a man, our Aaron Stoltzfoos. That's why we dropped him here."

"Better him than me," the Engineer said.

"Precisely," the Captain said. He turned to the Exec. "As soon as we've lifted, ask Colonel Harris to call on me in my cabin, Gene. Our Marines had better fresh-up their swordsmanship and cavalry tactics if they're to help our Inad Tuaregs establish that foundry on Qureysh."

"It sometimes seems you're more Ship's Anthropologist than Captain," the Engineer remarked.

"I'm an anthro-apologist, Hymie,

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like Mr. Kipling," the Captain said. *"There are nine and sixty ways of constructing tribal lays. And—every—single—one—of—them—is—right!"* Bells rang, and the ship surged. "Aaron and Martha, God keep you," the Captain said.

"Whoa!" Aaron shouted. He peered back toward the ship, floating up into grayness, the cavitation of her wake stirring the snow into patterns like fine-veined marble. *"Gott saygen eich,"* he said, a prayer for his departing friends.

His wife shivered. "It's cold enough to freeze the horns off a mooley-cow," she said. She glanced about at the snow-drifted little trees and clutched her black cloak tighter. "I'm feared, Stoltz. There's naught about us now but snow and black heathen."

"It's fear that is the heathen," Aaron said. *"By the word of the Lord were the heavens made; and the host of them by the breath of His mouth."* He kissed her. "I welcome you to our new homeland, wife," he said.

Behind them Wutzchen—"piglet"—grunted. Martha smiled back at the giant porker, perched amongst the cases and bags and household goods like the victim of some bawdy chiavari. "I've never heard a pig mutter so," she said.

"If he knew that his business here was to flatter the local lady-pigs with farrow, Wutzchen would hop out and run," Aaron said.

"Dummel dich, Stoltz," Martha said. "I've got to make your supper yet, and we don't have so much as a stove lit in our tent."

Stoltzfoos slapped the team back into motion. "What we need for our journey home are a few of the *altie lieder,"* he said, reaching back in the wagon for his scarred guitar. He strummed and hummed, then began singing in his clear baritone: *"In da guut alt Suumer-zeit . . .*

". . . In da guut alt Suumer-zeit," Martha's voice joined him. As they jolted along the path through the pine trees, heading toward Datura-village, near which their homestead stood, they sang the other homey songs to the music of the old guitar. *"Drawk Mich Zrick zu Alt Virginye,"* nostalgic for the black-garbed Plain Folk left at home. Then Aaron's fingers danced a livelier tune on the strings: *"Ich fang 'n neie Fashun aw,"* he crowed, and Martha joined in:

"A new fashion I'll begin," they sang,

"The hay I'll cut in the winter;

"When the sun-heat beats, I'll loaf in the shade

"And feast on cherry-pie.

"I'll get us a white, smearkase cow,

"And a yard full of guinea-hen geese;

"A red-beet tree as high as the moon,

"And a patent-leather fence.

"The chicken's I'll keep in the kitchen," they sang; whereupon Martha broke down laughing.

"It's a new world, and for now a cold world; but it's God's world, with home just up ahead," Aaron shouted. He pulled the wagon up next to the

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arctic tent that was to be their temporary farmhouse, beside the wagon loads of provision he'd brought before. He jumped down and swung Martha to earth. "Light the stove, woman; make your little kitchen bright, while I make our beasts feel welcome."

The Amishwoman pushed aside the entrance flap of the tent. Enclosed was a circle some twelve feet wide. The floor was bare earth. Once warmed by the pump-up "naptha" lantern and the gasoline hotplate, it would become a bog. Martha went out to the wagon to get a hatchet and set out for the nearby spinny of pines to trim off some twigs. Old Order manner forbid decorative floor-coverings as improper worldly show; but a springy carpet of pine-twigs could be considered as no more than a wooden floor, keeping two Plain Folk from sinking to their knees in mud.

The pots were soon boiling atop the two-burner stove, steaming the tent's air with onion-tangy *tzvivvele Supp* and the savory pork-smell of *Schnitz un Knepp,* a cannibal odor that disturbed not a bit Wutzchen, snoring behind the cookstove. Chickens, penned beneath the bed, chuckled in their bedtime caucus. The cow stood cheek-by-jowl with Yonnie, warming him with platonic graciousness as they shared the hay Aaron had spread before them. Martha stirred her soup. "When the bishop married me to you," she told Aaron, "he said naught of my having to sleep with a pig."

"Ah, but I thought you knew that to be the purpose of Christian marriage, woman," Aaron said, standing close.

"It's Wutz I mean," she said. "Truly, I mind not a bit living as in one of those automobile-wagons, since it's with you, and only for a little while."

"I'll hire a crew of our neighbors to help with the barn tomorrow," Aaron said. "That done, you'll have but one pig to sleep with."

After grace, they sat on cases of tobacco to eat their meal from a table of feed sacks covered with oilcloth. "The man in the ship's little kitchen let me make and freeze pies, Stoltz," Martha said. "He said we'd have a deepfreeze big as all outdoors, without electric, so use it. Eat till it's all, *Maan;* there's more back."

Yonnie bumped against Aaron's eating-elbow. "No man and his wife have eaten in such a zoo since Noah and his wife left the ark," Aaron said. He cut a slice of Schnitz-pie and palmed it against the bull's big snout to be snuffled up. "He likes your cooking," he said.

"So wash his face," Martha told him.

•

Outside the tent there was a clatter of horse-iron on frozen ground. "What the die-hinker is that?" Aaron demanded. He stood and picked up the naphtha lantern.

Outside, Aaron saw a tall black stranger, astride a horse as pale as the little Murnan moons that lighted him. *"Rankeshi dade!"* the visitor bellowed.

"May your life be a long one!" Aaron Stoltzfoos repeated in Hausa.

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Observing that his caller was brandishing a clenched fist, the Amishman observed the same ambiguous courtesy. "If you will enter, O Welcome Stranger, my house will be honored."

"Mother bless thee, Bearded One," the Murnan said. He dismounted, tossing his reins to one of the four retainers who remained on horseback. He entered the tent after Aaron; and stared about him at the animals, letting his dark eyes flick across Martha's unveiled face. At the Amishman's invitation, the visitor sat him-

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self on a tobacco case, revealing as he crossed his legs elaborately embroidered trousers and boot tops worked with designs that would dazzle a Texan. Martha bustled about hiding the remains of their meal.

The Murnan's outer dress was a woolen *riga,* the neckless gown of his West-African forefathers, with a blanket draped about his shoulders, exactly as those ancestors had worn one in the season of the cold wind called harmattan. Aaron introduced himself as Haruna, the Hausa version of his name; and the guest made himself known as Sarki—Chief—of the village of Datura. His given name was Kazunzumi. Wutzchen snuffled in his sleep. The Sarki glanced at the huge pig and smiled. Aaron relaxed a bit. The Islamic interdict on swine had been shed by the Murnans when they'd become apostates, just as Colonial Survey had guessed.

Stoltzfoos' Hausa, learned at the Homestead School at Georgetown University, proved adequate to its first challenge in the field, though he discovered, with every experimenter in a new language, that his most useful phrase was *magana sanoo-sanoo*: "please speak slowly." Aaron let the Chief commence the desultory conversation that would precede talk of consequence. Martha, ignored by the men, sat on the edge of the bed, reading the big German-language Bible. Aaron and Kazunzumi sang on in the heathen tongue about weather, beasts, and field-crops.

The Sarki leaned forward to examine Aaron's beard and shaven upper lip, once; and smiled. The Murnan does not wear such. He looked at Martha more casually now, seeing that the husband was not disgraced by his wife's naked face; and remarked on the whiteness of her skin in the same tones he'd mentioned Wutzchen's remarkable girth.

Aaron asked when the snows would cease, when the earth would thaw. The Sarki told him, and said that the land here was as rich as manure. Gradually the talk worked round to problems involving carpenters, nails, lumber, hinges—and money. Aaron was pleased to discover that the natives thought nothing of digging a cellar and raising a barn in midwinter, and that workers could be easily hired.

Suddenly Sarki Kazunzumi stood and slapped his palms together. The tent flap was shoved open. Bowed servants, who'd shivered outside for over an hour, placed their master's presents on the sack table, on the twig floor, even beside Martha on the bed. There were iron knives, a roast kid, a basket of peanuts, a sack of roasted coffee beans, a string of dried fruit, and a tiny earthware flask of perfume. There was even a woolen riga for Aaron, black, suggesting that the Survey had said a bit to the natives about Amish custom; and there were bolts of bright-patterned cloth too worldly for aught but quilts and infant-dresses, brightening Martha's eyes.

Aaron stood to accept the guest-gifts with elaborate thanks. Sarki Kazunzumi as elaborately bemeaned his

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offerings. "Musa the carpenter will appear on tomorrow's tomorrow," he said. "You will, the Mother willing, visit me in Datura tomorrow. We will together purchase lumber worthy of my friend-neighbor's barn-making. May the Mother give you strength to farm, Haruna! May the Mother grant you the light of understanding!"

"Sannu, sannu!" Stoltzfoos responded. He stood at the door of his tent, holding his lantern high to watch the Sarki and his servants ride off into the darkness.

"Er iss en groesie Fisch, nee?" Martha asked.

"The biggest fish in these parts," Aaron agreed. "Did you understand our talk?"

"The heathen speech is hard for me to learn, Stoltz," Martha admitted, speaking in the dialect they'd both been reared to. "While you had only the alien speech to study, I spent my time learning to grow the buglets and tell the various sorts apart. Besides, *unser guutie Deitschie Schproech, asz unser Erlayser schwetzt, iss guut genunk fa mier."* (Our honest German tongue, that our Saviour spoke, is good enough for me).

Aaron laughed. "So *altfashuned* a *Maedel* I married," he said. "Woman, you must learn the Hausa, too. We must be friends to these *Schwotzers,* as we were friends with the English-speakers back in the United Schtayts." He pushed aside the bolt of Murnan cloth to sit beside his wife, and leafed through the pages of their *Familien-Bibel,* pages lovingly worn by his father's fingers, and his grandfather's. "Listen," he commanded:

"For the Lord thy God bringeth thee into a good land, a land of brooks of water, of fountains and depths that spring out of valleys and hills; a land of wheat, and barley, and vines, and fig trees, and pomegranates; a land of oil olive, and honey; a land wherein thou shalt eat bread without scarceness, thou shalt not lack any thing in it; a land whose stones are iron, and out of whose hills thou mayest dig brass. When thou hast eaten and art full, then thou shalt bless the Lord they God for the good land which He hath given thee." Aaron closed the big book reverently. "Awmen," he said.

"Awmen," the woman echoed. "Aaron, with you beside me, I am not fretful."

"And with the Lord above us, I fear not in a strange land," Aaron said. He bent to scrape a handful of earth from beneath Martha's pine-twig carpet. *"Guuter Gruundt,"* he said. "This will grow tall corn. Tobacco, too; the folk here relish our leaf. There will be deep grasses for the beasts when the snow melts. We will prosper here, wife."

The next morning was cold, but the snowfall had ceased for a spell. The Stoltzfooses had risen well before the dawn; Martha to feed herself, her husband, and the chickens; Aaron to ready the horse and wagon for a trip into Datura. He counted out the hoard of golden cowries he'd been loaned as grubstake, did some arithmetic, and allowed his wife to pour

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him a second cup of coffee for the road. "You may expect the Sarki's wives to visit while I'm gone," he remarked.

"I'd be scared half to death!" Martha Stoltzfoos said. Her hands went to the back of her head, behind the lace prayer covering. "My hair's all strooby, this place is untidy as an auction yard; besides, how can I talk with those dark and heathen women? Them all decked out in golden bangles and silken clothes, most likely, like the bad lady of Babylon? Aaron Stoltz, I would admire a pretty to ride into town with you."

"Haggling for hired-help is man's *Bissiniss,*" he said. "When Kazunzumi's women come, feed them pie and peaches from the can. You'll find a way to talk, or women are not sisters. I'll be back home in time for evening chores."

Bumping along the trail into Datura, Aaron Stoltzfoos studied the land. A world that could allow so much well-drained black soil to go unfarmed was fortunate indeed, he mused. He thought of his father's farm, which would be his elder brother's, squeezed between railroad tracks and a three-lane highway, pressed from the west by an Armstrong Cork plant, the very cornstalks humming in harmony with the electric lines strung across the fields. This land was what the old folks had sought in America so long ago: a wilderness ripe for the plow.

The wagon rumbled along the hoof-pocked frozen clay. Aaron analyzed the contours of the hills for watershed and signs of erosion. He studied the patterns of the barren winter fields, fall-plowed and showing here and there the stubble of a crop he didn't recognize. When the clouds scudded for a moment off the sun, he grinned up, and looked back blinded to the road. Good tilth and friendship were promised here, gifts to balance loneliness. Five years from spring, other Amish folk would come to homestead—what a barn-raising they'd have! For now, though, he and Martha, come from a society so close-knit that each had always known the yield-per-acre of their remotest cousin-german, were in a land as strange as the New York City Aaron, stopping in for a phone-call to the vet, had once glimpsed on the screen of a gay-German neighbor's stereo-set.

Datura looked to Aaron like a city from the Bible, giving it a certain vicarious familiarity. The great wall was a block of sunbaked mud, fifty feet tall at the battlements, forty feet thick at its base; with bright, meaningless flags spotted on either side of the entrance tower. The cowhide-shielded gate was open. Birds popped out of mud nests glued to the mud wall and chattered at Aaron. Small boys wearing too little to be warm appeared at the opening like flies at a hog-slaughtering to add to the din, buzzing and hopping about and waving their arms as they called companions to view the black-bearded stranger.

Aaron whoaed his horse and took a

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handful of *anenes,* copper tenth-penny bits, to rattle between his hands. *"Zonang!"* he shouted: "Come here! Is there a boy amongst you brave enough to ride with an off-worlder to the Sarki's house, pointing him the way?"

One of the boys laughed at Aaron's slow, careful Hausa. "Let Black-Hat's whiskers point him the way!" the boy yelled.

"Uwaka! Ubaka!" Damning both parents of the rude one, another youngster trotted up to Aaron's wagon and raised a skinny brown fist in greeting. "Sir Off-Worlder, I who am named Waziri, Musa-the-Carpenter's son, would be honored to direct you to the house of Sarki Kazunzumi."

"The honor, young man, is mine," Stoltzfoos assured the lad, raising his own fist gravely. "My name is Haruna, son of Levi," he said, reaching down to hoist the boy up beside him on the wagon's seat. "Your friends have ill manners." He giddapped the horse.

"Buzzard-heads!" Waziri shouted back at his whilom companions.

"Peace, Waziri!" Aaron protested. "You'll frighten my poor horse into conniptions. Do you work for your father, the carpenter?"

"To, honorable Haruna," the boy said. "Yes." The empty wagon thumped over the wheel-cut streets like a wooden drum. "By the Mother, sir, I have great knowledge of planing and joining; of all the various sorts of wood, and the curing of them; all the tools my father uses are as familiar to me as my own left hand."

"Carpentry is a skillful trade," Aaron said. "Myself, I am but a farmer."

"By Mother's light! So am I!" Waziri said, dazzled by this coincidence. "I can cultivate a field free of all its noxious weeds and touch never a food-plant. I can steer a plow straight as a snapped chalk-string, grade seed with a sure eye; I can spread manure—"

"I'm sure you can, Waziri," Aaron said. "I need a man of just those rare qualificationns to work for me. Know you such a paragon?"

"Mother's name! Myself, your Honor!"

Aaron Stoltzfoos shook the hand of his hired man, an alien convention that much impressed Waziri. The boy was to draw three hundred anenes a day, some thirty-five cents, well above the local minimum-wage conventions; and he would get his bed and meals. Aaron's confidence that the boastful lad would make a farmer was bolstered by Waziri's loud calculations: "Three hundred coppers a day make, in ten day's work, a bronze cowrie; ten big bronzes make a silver cowrie, the price of an acre of land. Haruna, will you teach me your off-world farming? Will you allow me to buy land that neighbors yours?"

"Sei schtill, Buu," Aaron said, laughing. "Before you reap your first crop, you must find me the Sarki."

"We are here, Master Haruna."

The Sarki's house was no larger than its neighbors, Moorish-styled and domed-roofed like the others; but it

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wore on its streetside walls designs cut into the stucco, scrolls and arabesques. Just above the doorway, which opened spang onto the broadway of Datura, a grinning face peered down upon the visitors, its eyes ruby-colored glass.

Waziri pounded the door for Aaron, and stepped aside to let his new employer do the speaking. They were admitted to the house by a thin, old man wearing a pink turban. As they followed this butler down a hallway, Aaron and Waziri heard the shrieks and giggles of feminine consternation that told of women being herded into the zenana. The Amishman glimpsed one of the ladies, perhaps Sarki Kazunzumi's most junior wife, dashing toward the female sanctuary. Her eyes were lozenges of antimony; her hands, dipped in henna, seemed clad in pale kid gloves. Aaron, recalling pointers on Murnan etiquette he'd received at Georgetown, elaborately did not see the lady. He removed his hat as the turbaned butler bowed him to a plush-covered sofa. Waziri was cuffed to a mat beside the door.

"Rankeshi dade!" the Sarki said. "May the Mother bring you the light of understanding."

"Light and long life, O Sarki," Stoltzfoos said, standing up.

"Will the guest who honors my roof-cup taste coffee with his fortunate host?" the Sarki asked.

"The lucky guest will be ever the Sarki's servant if your Honor allows him to share his pleasure with his fellow-farmer and employee, Waziri the son of Musa," Aaron said.

"You'd better have hired mice to guard your stored grain, O Haruna; and blowflies to curry your cattle, than to have engaged the son of Musa as a farmer," Kazunzumi growled. "Waziri has little light of understanding. He will try to win from the soil what only honest sweat and Mother's grace can cause to grow. This boy will gray your beard, Haruna."

"Perhaps the sun that warms the soil will light his brains to understanding," Aaron suggested.

"Better that your hand should leave the plowhandle from time to time to warm his lazy fundament," the Sarki said.

"Just so, O Sarki," the Amishman said. "If Waziri does not serve me well, I have an enormous boar who will, if kept long enough from wholesomer food, rid me of a lazy farmhand." Waziri grinned at all the attention he was getting from the two most important men in town, and sat expectantly as the turbaned elder brought in coffee.

Stoltzfoos watched the Sarki, and aped his actions. Water was served with the coffee; this was to rinse the mouth that the beverage could be tasted with fresh taste buds. The coffee was brown as floodwater silt, heavy with sugar, and very hot; and the cups had no handles. "You are the first European I have seen for many years, friend Haruna," the Sarki said. "It is five years gone that the white off-worlders came, and with a black man as their voice purchased with silver the land you now farm."

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"They bought well," Aaron said; "the seller sold justly. When the fist of winter loosens, the soil will prove as rich as butter."

"When the first green breaks through, and you may break the soil without offense, you will do well," Kazunzumi said. "You are a man who loves the land."

"My fathers have flourished with the soil for twenty generations," the Amishman said. "I pray another twenty may live to inherit my good fortune."

"Haruna," the Sarki said, "I see that you are a man of the book, that volume of which Mother in her grace turns over a fresh page each spring. Though your skin is as pale as the flesh of my palm, though you have but one wife, though you speak throat-deep and strangely, yet you and I are more alike than different. The Mother has given you light, Haruna, her greatest gift."

"I thank the Sarki for his words," Aaron said. "Sir, my good and only wife—I am a poor man, and bound by another law than that of the fortunate Kazunzumi—adds her thanks to mine for the rich gifts the Chief of Datura presented us, his servants. In simple thanks, I have some poor things to tender our benefactor."

Waziri, perceiving the tenor of Aaron's talk, sprang to his feet and hastened out to the wagon for the bundles he'd seen under the seat. He returned, staggering under a seventy-pound bale of long-leaf tobacco, product of Aaron's father's farm. He went back for a bolt of scarlet silk for the Sarki's paramount wife, and strings of candy for the great man's children. He puffed in with one last brown-wrapped parcel, which he unpacked to display a leather saddle. This confection was embossed with a hundred intricate designs, rich with silver; un-Amish as a Christmas tree. Judging from the Sarki's dazzled thanks, the saddle was just the thing for a Murnan Chief.

As soon as Kazunzumi had delivered his pyrotechnic speech of thanks, and had directed that Aaron's gifts be placed on a velvet-draped dais at the end of the room, a roast kid was brought in. Waziri, half drunk with the elegance of it all, fell to like any other adolescent boy, and was soon grease to the armpits. Aaron, more careful, referred his actions to the Sarki's. The bread must be broken, not cut; and it was eaten with the right hand only, the left lying in the lap as though broken. Belching seemed to be *de rigueur* as a tribute to the cuisine, so Aaron belched his stomach flat.

Business could now be discussed. Aaron, having no pencil, traced with a greasy finger on the tile floor the outlines of the barn and farmhouse he envisaged. The Sarki from time to time demanded of young Waziri such facts as a carpenter's son might be expected to know, and added lumber-prices in his head as Aaron's bank-barn and two-story farmhouse took form in his imagination. Finally he told the Amishman what the two buildings would cost. Better pleased by this figure than he'd expected to

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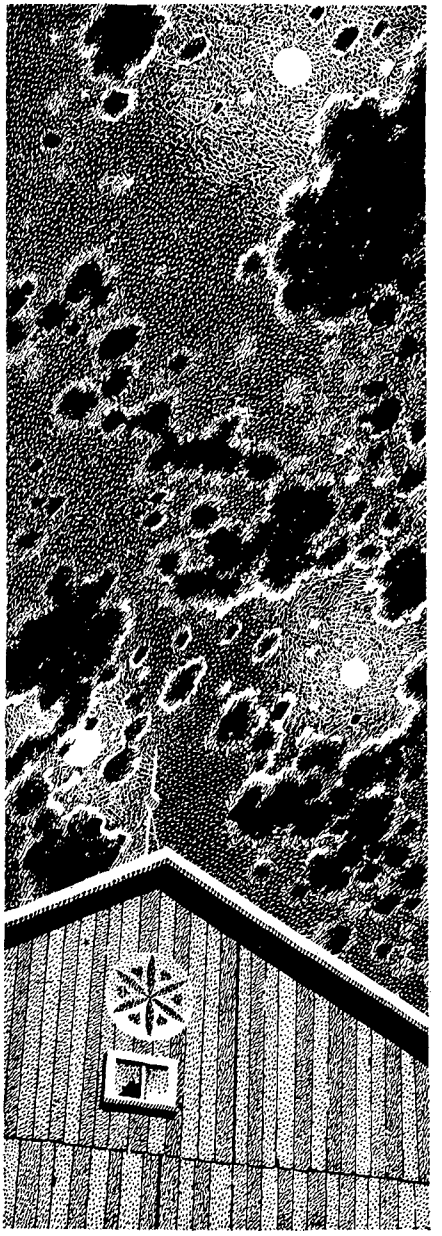
be, Aaron initiated the long-drawn ceremony required to discharge himself from Kazunzumi's hospitality.

As the Stoltzfoos wagon jolted out the gate of Datura, bearing the cot and clothes-trunk of Waziri together with the owner of those chattels, the boys who'd jeered before now stared with respect. The black-hatted *Turawa* had been to visit the Sarki; this established him as no safe man to mock. Waziri gave his late playmates no notice beyond sitting rather straighter on the wagon seat than was comfortable.

There was light enough left when they got back to the farm for Aaron and Waziri to pace out the dimensions of the barn and house. The bank-barn would go up first, of course. No Christian owner of beasts could consent to being well-housed while his animals steamed and shivered in a cloth-sided tent. Waziri pounded stakes into the frozen ground to mark the corners of the barn. Aaron pointed out the drainage-line that would have to be ditched, and explained how the removed earth would be packed, with the clay dug for the cellar, into a ramp leading to the barn's second story in the back. Come next fall, the hayladder could be pulled right up that driveway to be unloaded above the stalls. Aaron took the boy to the frozen-solid creek to show him where a wheel could be placed to lift water to a spillway for the upper fields. He introduced his new helper to Wutzchen, and was pleased to hear Waziri speak



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wistfully of pork chops. Waziri didn't want to meet Martha yet, though. As a proper Murnan boy, he was not eager to be introduced to the boss' barefaced wife, though she bribed him with a fat wedge of applecake.

When Waziri set out with the lantern to tend to the final outdoor chores, Aaron inquired of his wife's day. The Sarki's Paramount Wife, with two servants, had indeed visited, bringing more gifts of food and clothing. Somehow the four of them had managed to breach the Hausa-*Pennsylfawnisch*. *Deitsch* curtain. "What in the world did you talk about?" Aaron asked.

"First, not knowing what to say, I showed the ladies a drop of vinegar under the microscope," Martha said. "They screamed when they saw all the wriggly worms, and I was put to it to kēep them from bundling back home. Then we talked about you, Stoltz, and about the farm; and when would I be giving you *Kinner* to help with all the work," she said. Martha fiddled with the cloak she was sewing for her husband. "It was largely their heathen speech we used, so I understood only what they pointed at; but they ate hearty of anything without vinegar in it, and I laughed with them like with friends at a quilting-bee. My, Stoltz! Those *Nay-yer* women are lovely, all jeweled like queens, even the servant girls; even though they have no proper understanding of Christian behavior."

"Did they make you feel welcome, then?" Aaron asked.

"*Ach, ja!* They pitied me, I thought," Martha said. "They said you must be poor, to have but one wife to comfort you; but they said that if the crops be good, you can earn a second woman by next winter. *Chuudes Paste!*"

"I hope you told the Sarki's woman we've been married only since haying-time," Aaron said, "and it's a bit previous for you to be giving me little farmhands."

"I did that," Martha said. "I told them, too, that by the time the oak leaves are the size of squirrel's ears—if this place has oaks, indeed, or squirrels—we'd have a youngling squalling in our house, loud as any of the Sarki's."

Waziri, crouched near the tent to pick up such talk as might pass inside concerning himself, was at first dismayed by Aaron's whoops of joy. Then Martha joined her husband in happy laughter. Since her tiny-garments line had been delivered in Low Dutch, the young Murnan chose to believe that the enthusiastic sounds he heard within the tent reflected joy at his employment.

It was cold the week the barn was raised, and the mattocks had heavy work gouging out frozen earth to be heaped into the bank leading up the back. The Murnan laborers seemed to think midwinter as appropriate as any other time for building; they said the Mother slept, and would not be disturbed. Martha served coffee and buttermilk-pop at break-time, and presided over noontime feasts, served in

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several sittings, in the tent. Before the workers left in the evening, Aaron would give each a drink out back, scharifer cider, feeling that they'd steamed hard enough to earn a sip of something volatile. There are matters, he mused, in which common sense can blink at a bishop; as in secretly trimming one's beard a bit, for example, to keep it out of one's soup; or plucking a guitar to raise the spirits.

When the fortnight's cold work was done, the Stoltzfoos Farm was like nothing seen before on Murna. The bank-barn was forty feet high. On its lee side, Aaron had nailed thin, horizontal strips of wood about a foot apart, hoping to encourage the mud-daubing birds he'd seen on the wall at Datura to plaster their nests onto his barn, and shop for insects in his fields. Lacking concrete, he'd constructed a roofless stone hut abutting the barn to serve as his manure shed. The farmhouse itself was a bit gay, having an inside toilet to cheat the Murnan winters and a sunporch for Martha's bacteriological equipment. As the nearest Amish *Volle Diener*—Congregational Bishop—was eighty light-years off, and as the circumstances were unusual, Aaron felt that he and Martha were safe from the shunning—*Meidung*—that was the Old Order's manner of punishing Amischers guilty of "going gay" by breaking the church rules against worldly show.

A third outbuilding puzzled the Murnan carpenters even more than the two-storied wooden house and the enormous barn. This shed had hinged sidings that could be propped out to let breezes sweep through the building. Aaron explained to Musa the function of this tobacco shed, where he would hang his lathes of long-leafed tobacco to cure from August through November. The tobacco seedlings were already sprouting in Mason jars on the sunporch windowsills. The bank-barn's basement was also dedicated to tobacco. Here, in midwinter, Aaron and Martha and Waziri would strip, size, and grade the dry leaves for sale in Datura. Tobacco had always been a prime cash-crop for Levi, Aaron's father. After testing the bitter native leaf, Aaron knew that his Pennsylvania Type 41 would sell better here than anything else he could grow.

Martha Stoltzfoos was as busy in her new farmhouse as Aaron and Waziri were in the barn. Her kitchen stove burned all day. Nothing ever seen in Lancaster County, this stove was built of fireclay and brick; but the food it heated was honest Deitsch. There were pickled eggs and red beets, ginger tomatoes canned back home, spiced peaches, pickled pears, mustard pickles and chowchow, pickled red cabbage, Schnitz un Knepp, shoo-fly pie, vanilla pie, rhubarb sauce, Cheddar cheeses the size of Waziri's head, haystacks of sauerkraut, slices off the great slab of home-preserved chipped beef, milk by the gallon, stewed chicken, popcorn soup, rashers of bacon, rivers of coffee. In the evenings, protecting her fingers from the sin of idleness, Martha quilted and

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cross-stitched by lamplight. Already her parlor wall boasted a framed motto that reduced to half a dozen German words, the Amish philosophy of life: "What One Likes Doing is No Work."

For all the chill of the late-winter winds, Aaron kept himself and his young helper in a sweat. Martha's cooking and the heavy work were slabbing muscle onto Waziri's lean, brown frame. Aaron's farming methods, so much different to Murnan routines, puzzled and intrigued the boy. Aaron was equally bemused by the local taboos. Why, for example, did all the politer Murnans eat with the right hand only? Why did the women veil themselves in his presence? And what was this Mother-goddess worship that seemed to require no more of its adherents than the inclusion of their deity's name in every curse, formal and profane? "Think what you please, but not too loud," Aaron cautioned himself, and carefully commenced to copy those Murnan speech-forms, gestures, and attitudes that did not conflict with his own deep convictions.

But the soil was his employment, not socializing. Aaron wormed his swine, inspected his horse-powered plow and harrow, gazed at the sun, palpated the soil, and prayed for an early spring to a God who understood German. Each day, to keep mold from strangling the moist morsels, he shook the jars of tobacco seed, whose hair-fine sprouts were just splitting the hulls.

The rations packaged in Pennsylvania were shrinking. The Stoltzfoos stake of silver and gold cowries was wasting away. Each night, bruised with fatigue, Aaron brought his little household into the parlor while he read from the Book that had bound his folk to the soil. Waziri bowed, honoring his master's God in his master's manner, but understoood nothing of the hard High German: *"For the Lord God will help me: therefore shall I not be confounded: therefore have I set my face like a flint, and I know I shall not be ashamed.* Awmen."

"Awmen," said Martha.

"Awmen," said Waziri, fisting his hand in respect to his friend's bearded God.

The Murnan neighbors, to whom late winter was the slackest season in the farm-year, visited often to observe and comment on the off worlder's work. Aaron Stoltzfoos privately regarded the endless conversations as too much of a good thing; but he realized that his answering the Murnan's questions helped work off the obligation he owed the government for the eighty light-years' transportation it had given him, the opportunity he'd been given to earn this hundred acres with five years' work, and the interest-free loans that had put up his barn and farmhouse.

With Waziri hovering near, Aaron's proud lieutenant, the neighbors would stuff their pipes with native tobacco, a leaf that would have gagged one of Sir Walter Raleigh's Indian friends, while the Amishman lit a

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stogie in self-defense. Why, the neighbor farmers demanded, did Aaron propose to dust his bean-seeds with a powder that looked like soot? Martha's microscope, a wonder, introduced the Murnans to bacteria; and Aaron tediously translated his knowledge of the nitrogen-fixing symbiotes into Hausa. But there were other questions. What was the purpose of the brush stacked on top of the smooth-raked beds where Aaron proposed to plant his tobacco-seedlings? He explained that fire, second best to steaming, would kill the weed-seeds in the soil, and give the tobacco uncrowded beds to prosper in.

Those needles with which he punctured the flanks of his swine and cattle: what devils did they exorcise? Back to the microscope for an explanation of the disease-process, a sophistication the Murnans had lost in the years since they'd left Kano. What were the bits of blue and pink paper Aaron pressed into mudballs picked up in the various precincts of his property? Why did those slips oftentime change color, from blue to pink, or pink-to-blue? What was in those sacks of stuff—no dung of animals, but a sort of flour—that he intended to work into his soil? Aaron answered each question as best he could, Waziri supplying—and often inventing—Hausa words for concepts like phosphorous, ascarid worms, and litmus.

Aaron had as much to learn from his brown-skinned neighbors as he had to teach them. He was persuaded to lay in a supply of seed-yams, guaranteeing a crop that would bring bronze cowries next fall in Datura, the price of next year's oil and cloth and tools. The peanut, a legume Aaron had no experience of beyond purchasing an occasional tooth-ful at the grocery-store, won half a dozen acres from Korean lespedeza, the crop he'd at first selected as his soil-improver there. He got acquainted with a plant no Amishman before him had ever sown, a crabgrass called fonio, a staple cereal and source of beer-malt on Murna, imported with the first Nigerian colonists.

Aaron refused to plant any lalle, the henna-shrub from which the Murnans made the dye to stain their women's hands, feeling that it would be improper for him to contribute to such a vanity. Bulrush millet, another native crop, was ill suited to Aaron's well-drained fields. He planned to grow corn, though, the stuff his people called *Welschkarn*—alien corn. Though American enough, maize had been a foreigner to the first Amish farmers, and still carried history in its name. This crop was chiefly for Wutzchen, whose bloodlines, Aaron was confident, would lead to a crop of pork of a quality these heretics from Islam had never tasted before.

Work wasn't everything. One Sunday, after he and Martha had sung together from the *Ausbund,* and Aaron had read from the *Schrift* and the *Martyr's Mirror,* there was time to play.

Sarki Kazunzumi and several other

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gentlemen who enjoyed City Hall or Chamber of Commerce standing in Datura had come to visit the Stoltzfooses after lunch; as had Musa the carpenter and his older son, Dauda, Waziri's brother. Also on the premises were about a dozen of the local farmers and craftsmen, inspecting the curious architecture the off-worlder had introduced to their planet. Aaron, observing that the two classes of his guests were maintaining a polite fiction, each that the other was not present, had an idea. He'd seen Murnans in town at the midwinter festival, their status-consciousness forgotten in mutual quaffs of fonio-beer or barley-brandy, betting together at horse-races and wheels-of-fortune. "My friends," the Amishman addressed the Murnans gathered in his barn, inspecting Wutzchen, "let's play a game of ball."

Kazunzumi looked interested. As the local Chief of State, the Sarki's approval guaranteed the enthusiasm of all the lesser ranks.

Aaron explained the game he had in mind. It wasn't baseball, an "English" sport foreign to Amishmen, who can get through their teens without having heard of either Comiskey Park or the World Series. Their game, *Mosch Balle,* fits a barnyard better.

In lieu of the regulation softball used in the game of Corner Ball, Martha had stitched together a sort of large beanbag. The playing-field Aaron set up with the help of his visitors was a square some twelve yards on a side, fence-rails being propped up to mark its boundaries and fresh straw forked onto it six inches deep as footing.

Aaron's eight-man team was chosen from the working-stiffs. The opposing eight were the Brass. To start the game, four of the proletarians stood at the corners of the square; and two men of Kazunzumi's team waited warily within.

Aaron commenced to explain the game. To say that the object of *Mosch Balle* is for a member of the outer, offensive, team to strike an inner, defensive man with the ball is inadequate; such an explanation is as lacking as to explain baseball as the pitcher's effort to throw a ball so well that it's hittable, and so very well that it yet goes unhit. Both games have their finer points.

"Now," Aaron told his guests on the field, "we four on the corners will toss the ball back and forth amongst ourselves, shouting *Hah, Oh, Tay,* with each pitch. Whoever has the ball on *Tay* has to fling it at one of the two men inside the square. If he misses, he's Out; and one of the other men on our team takes his place. If he hits his target-man, the target's Out, and will be replaced by another man from the Sarki's team. The team with the last man left on the straw wins the first half. *Des iss der Weeg wie mir's diehne,* O.K.?"

"Afuwo!" the Sarki yelled, a woman's call, grinning, crouched to spring aside. "Hah!" Aaron shouted, and tossed the ball to Waziri's older brother, Dauda. "Oh!" Dauda yelled, and threw the ball to the shoemaker. "Tay!" the cobbler exulted, and

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slammed the ball at the lower-ranking of the two men within the square, the village banker. The shoemaker missed, and was retired.

The Daturans were soon stripped down to trousers and boots, their black torsos steaming in the cold air. Aaron removed his shirt—but not his hat—and so far forgot his Hausa in the excitement that he not only rooted for his teammates in *Pennsylfawnisch Deitsch,* but even punctuated several clumsy plays with raw *Fadomm*'s.

Aaron's skill won the first half for his team. Blooded, the Chamber of Commerce Eight fought through to win the second half. A tie. The playoff saw the Working-Man's League pummeled to a standstill by the C-of-C, who took the laurels with a final slam that knocked Waziri into the straw, protesting that it was an accident.

Sweating, laughing, social status for the moment forgotten, the teams and their mobs of fans surged into the farmhouse to demand of Martha wedges of raisin pie and big cups of strong coffee. As the guests put their rigas and their white caps back on, and assumed therewith their game-discarded rank of class, they assured Aaron that the afternoon at the ball game had been a large success.

The next day was crisp and cold. With nothing more to be done till the soil thawed, Aaron took Waziri down to the creek to investigate his project of irrigating the hilltop acres. The flow of water was so feeble that the little stream was ice to its channel. "Do you have hereabouts a digger-of-waterholes?" Aaron asked the boy. Waziri nodded, and supplied the Hausa phrase for this skill. "Good. *Wonn's Gottes wille iss,* I will find a spot for them to dig, smelling out the water as can my cousin Blue Ball Benjamin Blank," Aaron said. "Go get from the barn the pliers, the hand-tool that pinches."

Waziri trotted off and brought back the pliers. "What are you up to, Haruna-boss?" he asked. Aaron was holding the bulldog pliers out before him, one handle in each hand, parallel to the ground.

"I am smelling for the well-place," the Amishman said, pacing deliberately across the field. The boy scampered along beside him. "We will need at least one well to be safe from August draught. Cousin Benjamin found the wet depths in this fashion; perhaps it will work for me." Aaron walked, arms outstretched, for half an hour before his face grew taut. He slowed his walking and began to work toward the center of a spiral. Waziri could see the sweat springing up on the young farmer's brow and fingers, despite the cold breeze that blew. The bulldog pliers trembled as though responding to the throbbing of an engine. Suddenly, as though about to be jerked from Aaron's hands, the pliers tugged downward so forceably that he had to lift his elbows and flex his wrists to hold onto them. "Put a little pile of stones here, Waziri," he said. "We'll have the diggers visit as soon as the ground thaws."

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Waziri shook his head. "Haruna, they will not touch soft earth until the first grass sprouts," he said.

"Time enough," Aaron said. He looked up to satisfy himself that his prospective well-site was high enough to avoid drainage from his pig-yard, then left the Murnan boy to pile up a cairn for the diggers. It would be good to have a windmill within earshot of the house, he mused; its squeaking would ease Martha with a homey sound. Alone for a few minutes, Aaron retired to the workshop in the cellar of the barn. He planed and sanded boards of a native lumber very like to tulipwood. Into the headboard of the cradle he was making, he keyhole-sawed the same sort of broad Dutch heart that had marked his own cradle, and the cradles of all his family back to the days in the Rhineland, before they'd been driven to America.

Martha Stoltzfoos was speaking Hausa better than she'd spoken English since grade-school days, and she kept busy in the little bacteriological laboratory on her sunporch, keeping fresh the skills she'd learned at Georgetown and might some day

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need in earnest; but she still grew homesick as her child-coming day drew nearer. It was wrong, she told Aaron, for an Amishwoman to have heathen midwives at her lying-in. For all their kindness, the Murnan women could never be as reassuring as the prayer-covered, black-aproned matrons who'd have attended Martha back home. "Ach, Stoltz," she told her husband, "if only a few other of *unser sart Leit* could have come here with us."

"Don't worry, Love," Aaron said. "I've eased calves and colts enough into the world; man-children can't come so different."

"You talk like a man," Martha accused him. "I wish my Mem was just down the road a piece, ready to come a-running when my time came," she said. She put one hand on her apron. *Chuudes Paste!* The little rascal is wild as a colt, indeed. Feel him, Stoltz!"

Aaron dutifully placed his hand to sense the child's quickening. "He'll be of help on the farm, so strong as he is," he remarked. Then, tugging his hat down tight, Aaron went outdoors, bashful before this mystery.

The little creek had thawed, and the light of the sun on a man's face almost gave back the heat the air extorted. Waziri had gone to town today for some sort of Murnan spring-festival, eager to celebrate his hard-earned wealth on his first day off in months. The place seemed deserted, Aaron felt, without the boy; without the visitors he'd played ball and talked crops with, striding up in their scarlet-trimmed rigas to gossip with their friend Haruna.

Between the roadway and the house, Aaron knelt to rake up with his fingers a handful of the new-thawed soil. He squeezed it. The clod in his hand broke apart of its own weight: it was not too wet to work. Festival-day though it was to his *Schwotzer* neighbors, he was eager to spear this virgin soil with his plow blade.

Aaron strode back to the barn. He hitched Rosina—the dappled mare, named "Raisin" for her spots—to the plow and slapped her into motion. Sleek with her winter's idleness, Rosina was at first unenthusiastic about the plow; but the spring sun and honest exercise warmed her quickly. Within half an hour she was earning her keep. Though Aaron was plowing shallow, the compact soil broke hard. Rosina leaned into the traces, leaving hoofprints three inches deep. No gasoline tractor, Aaron mused, could ever pull itself through soil so rich and damp. *Geilsgrefte,* horsepower, was best exerted by a horse, he thought.

The brown earth-smells were good. Aaron kicked apart the larger clods, fat with a planet-life of weather and rich decay. This land would take a good deal of disking to get it into shape. His neighbors, who'd done their heavy plowing just after last fall's first frost, were already well ahead of him. He stabled Rosina at sundown, and went in to sneak a well-earned glass of hard cider past Martha's teetotaling eye.

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Musa the carpenter brought his son home well after dark. Waziri had had adventures, the old man said; dancing, gambling on the Fool's Wheel, sampling fonio-beer, celebrating his own young life's springtime with the earth's. Both the old man and the boy were barefoot, Aaron noticed; but said nothing: perhaps shoelessness was part of their spring-festival.

Waziri, a bit *geschwepst* with the beer, tottered off to bed. "Thanks to you, friend Haruna, that boy became a man today," the carpenter said. He accepted a glass of Aaron's cider. "Today Waziri's wallet jingled with bronze and copper earned by his own sweat, a manful sound to a lad of fifteen summers. I ask pardon for having returned your laborer in so damaged a condition, brother Haruna; but you may be consoled with the thought that the Mother's festival comes but once in the twelvemonth."

"No harm was done, brother Musa," Aaron said, offering his visitor tobacco. "In my own youth, I sometimes danced with beer-light feet to the music of worldly guitars; and yet I reached a man's estate."

Offered a refill for his pipe, Musa raised a hand in polite refusal. "Tomorrow's sun will not wait on our conversation, and much must be done, in the manner of racers waiting the signal, before the first blade breaks the soil," he said. "Good night, brother Haruna; and may Mother grant you light!"

"Mother keep you, brother Musa," Aaron murmured the heathen phrase without embarrassment. "I'll guide your feet to your wagon, if I may."

Aaron, carrying the naphtha lantern, led the way across the strip of new-plowed soil. Set by frost into plastic mounds and ridges, the earth bent beneath his shoes and the carpenter's bare feet. Aaron swung Musa's picket-iron, the little anchor to which his horse was tethered, into the wagon, noticing that it had been curiously padded with layers of quilted cloth. "May you journey home in good health, brother Musa," he said.

"Uwaka!" Musa shouted, staring at the plow-cuts.

Aaron Stoltzfoos dropped the lantern to his side, amazed that the dignified old man could be guilty of such an obscenity. Perhaps he'd misheard. "Haruna, you have damned yourself!" Musa bellowed. "Cursed be this farm! Cursed be thy farming! May thy seedlings rot, may thy corn sprout worms for tassles, may your cattle stink and make early bones!"

"Brother Musa!" Aaron said.

"I am no sib to you, O Bearded One," Musa said. "Nor will I help you carry the curse you have brought upon yourself by today's ill-doing." He darted back to the farmhouse, where he ordered half-wakened Waziri to pad barefoot after him to the wagon, rubbing his eyes. "Come, son," Musa said. "We must flee these ill-omened fields." Without another word to his host, the carpenter hoisted his boy into the wagon, mounted, and set off

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into the night. The hoofs of his horse padded softly against the dirt road, unshod.

Martha met the bewildered Aaron at the door, wakened by Musa's shouting. "*Wass gibt,* Stoltz?" she asked. "What for was all the carry-on?"

Aaron tugged at his beard. "I don't know, woman," he admitted. "Musa the carpenter took one look at the plowing I did today, then cursed me as though he'd caught me spitting in his well. He got Waziri up from bed and took him home." He took his wife's hand. "I'm sorry he woke you up, Liebchen."

"It was not so much the angry carpenter who waked me as the little jack rabbit you're father to," Martha said. "As you say, a *Buu* who can kick so hard, and barefoot, too, will be a strong one once he's born."

Aaron was staring out the window onto the dark road. "*Farwas hot Musa sell gehuh?*" he asked himself. "What for did Musa do such a thing? He knows that our ways are different to his. If I did aught wrong, Musa must know it was done not for want to harm. I will go to the village tomorrow; Musa must forgive me and explain."

"He will, Stoltz," Martha said. "*Kuum, schloef.* You'll be getting up early."

"How can I sleep, not knowing how I have hurt my friend?" Aaron asked.

"You must," Martha urged him. "Let your cares rest for the night, Aaron."

In the morning, Stoltzfoos prepared for his trip into Datura by donning his Sunday-best. He clipped a black patent-leather bow tie, a wedding gift, onto his white shirt; and fastened up his best broadfall trousers with his dress suspenders. Over this, Aaron put his *Mutzi,* the tailed frock coat that fastened with hooks-and-eyes. When he'd exchanged his broad-brimmed black felt working-hat for another just the same, but unsweated, Aaron was dressed as he'd be on his way to a House-Amish Sunday meeting back home. "I expect no trouble here, Martha," he said, tucking a box of stogies under his arm as a little guest-gift for the old carpenter.

"Hurry home, Stoltz; I feel wonderful busy about the middle," Martha said. There was a noise out on the road. "Listen!" she said. "Go look the window out, now; someone is coming the yard in!"

Aaron hastened to lift the green roller-blind over the parlor window. "Ach; it is the *groesie Fisch,* Sarki Kazunzumi, with half the folk from town," he said. "Stay here, woman. I will out and talk with them."

The Sarki sat astride his white pony, staring as Aaron approached him. Behind their chief, on lesser beasts, sat Kazunzumi's retainers, each with a bundle in his arms. "Welcome, O Sarki!" Aaron said, raising his fist.

Kazunzumi did not return the Amishman's salute. "I return your gifts, Lightless One," he announced. "They are tainted with your blasphemy." He nodded, and his servants

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dismounted to stack at the side of the road Aaron's guest-gifts of months before. The bale of tobacco was set down, the bolt of scarlet silk, the chains of candy, the silver-filigreed saddle. "Now that I owe you naught, Bearded One, we have no further business with one another." He reined his horse around. "I go in sadness, Haruna," he said.

"What did I do, Kazunzumi?" Aaron asked. "What am I to make of your displeasure?"

"You have failed us, who was my friend," the Sarki said. "You will leave this place, taking your woman and your beasts and your sharp-shod horses."

"Sir, where am I to go?"

"Whence came you, Haruna?" the Sarki asked. "Return to your own black-garbed folk, and injure the Mother no longer with your lack of understanding."

"Sarki Kazunzumi, I know not how I erred," Stoltzfoos said. "As for returning to my own country, that I cannot. The off-world vessel that brought us here is star-far away; and it will not return until we are all five summers older. My Martha is besides with child, and cannot safely travel. My land is ripe for seeding. How can I go now?"

"There is wilderness to the south, where no son of the Mother lives," the Sarki said. "Go there. I care not for heathen who are out of my sight."

"Sir, show us mercy," Aaron said.

Kazunzumi danced his shoeless horse around to face Aaron. "Haruna, who was my friend, whom I thought to stand with me in Mother's light, I would be merciful; but I cannot be weak. It is not me whom you must beseech, but the Mother who feeds us all. Make amends to Her, then Sarki Kazunzumi will give his ear to your pleas. Without amends, Haruna, you must go from here within the week." Kazunzumi waved his arm and galloped off toward Datura. His servants followed quickly. On the roadside lay the gifts, dusted from the dirt raised by the horses.

The Amishman turned toward the house. Martha's face was at the parlor window, quizzical under her prayer-covering, impatient to hear what had happened. Aaron plodded back to the house with the evil news, stumbling over a clod of earth in the new-turned furrows near the road. Martha met him at the door. *"Waas will er?"* she demanded.

"He says we must leave our farm."

"Why for?" she asked.

"Somehow, I have offended their *fadommt* Mum-god," Aaron said. "The Sarki has granted us a week to make ready to go into the wilderness." He sat on a coffee-colored kitchen chair, his head bowed and his big hands limp between his knees.

"Stoltz, where can we go?" Martha asked. "We have no *Freindschaft,* no kin, in all this place."

Aaron tightened his hands into fists. "We will not go!" he vowed. "I will find a way for us to stay." He broke open the box of cigars that had been meant as a gift for Musa and

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clamped one of the black stogies between his teeth. "What is their *heidisch* secret?" he demanded. "What does the Mother want of me?"

"Aaron Stoltz," Martha said vigorously, "I'll have no man of mine offering dignity to a heathen god. The *Schrift* orders us to cut down the groves of the alien gods, to smash their false images; not to bow before them. Will you make a golden calf here, as did your namesake Aaron of Egypt, for whose sin the Children of Israel were plagued?"

"Woman, I'll not have you preach to me like a servant of the Book," Aaron said. "It is not for you to cite Scripture." He stared through the window. "What does the Mother want of me?"

"As you shout, do not forget that I am a mother, too," Martha said. She dabbed a finger at her eye.

"Fagep mir, Liebling," Aaron said. He walked behind the chair where his wife sat. Tenderly, he kneaded the muscles at the back of her neck. "I am trying to get inside Musa's head, and Kazunzumi's; I am trying to see their world through their eyes. It is not an easy thing to do, Martha. Though I lived for a spell among the 'English,' my head is still House-Amish; a fat, Dutch cheese."

"It is a good head," Martha said, relaxing under his massage, "and if there be cheese-heads hereabouts, it's these blackfolk that wear them, and not my man."

"If I knew what the die-hinker our neighbors mean by their Mother-talk, it might be I could see myself through Murnan eyes, as I can hear a bit with Hausa ears," Aaron said. *"Iss sell nix so;* Martha?"

"We should have stood at home, and thought with our own good heads," she said.

"Let me think," Aaron said. "If I were to strike you, wife," he mused, "it could do you great hurt, and harm our unborn child, *Nee?"*

"Aaron!" Martha scooted out from under her husband's kneading hands.

"Druuvel dich net!" he said. "I am only thinking. These blackfolk now, these neighbors who were before last night our friends, speak of Light as our bishop at home speaks of Grace. To have it is to have all, to be one with the congregation. If I can find this Light, we and the Sarki and his people can again be friends." Aaron sat down. "I must learn what I have done wrong," he said.

"Other than drink a glass of cider now and then, and make worldly music with a guitar, you've done no wrong," Martha said stubbornly. "You're a good man."

"In the Old Order, I am a good man, so long as no *Diener* makes trouble over a bit of singing or cider," Aaron said. "As a guest on Murna, I have done some deed that has hurt this Mother-god, whom our neighbors hold dear."

"Heathenish superstitition!"

"Martha, love, I am older than you, and a man," Aaron said. "Give me room to think! If the goddess-Mother is heathen as Baal, it matters not; these folk who worship her hold our

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future in their hands. Besides, we owe them the courtesy not to dance in their churches nor to laugh at their prayers; even the 'English' have more grace than that." Aaron pondered. "Something in the springtime is the Murnan Mother's gift, her greatest gift. What?"

"Blaspheme not," Martha said. "Remember Him who *causeth the grass to grow for the cattle, and herb for the service of man: that he may bring forth food out of the earth.*"

"Wife, is the True God less, if these people call Him Mother?" Aaron demanded.

"We are too far from home," the woman sighed. "Such heavy talk is wearisome; it is for bishops to discourse so, not ordinary folk like us."

"If I can't find the light," Aaron said, "this farm we live on, and hoped to leave to our children, isn't worth the water in a dish of soup." He slapped his hands together and stood to pace. "Martha, hear me out," he said. "If a woman be with child, and a man takes her with lust and against her will, is not that man accursed?"

"Aaron!" she said. "*Haagott,* such wicked talk you make!"

"Seen with Murnan eyes, have I not done just such a cursed thing?" Aaron demanded. "The Mother-god of this world is *mit Kinndt,* fat with the bounty of springtime. So tender is the swollen belly of the earth that the people here, simple folk with no more subtle God, strip the iron from the hoofs of their horses not to bruise her. They bare their feet in her honor, treat her with the tenderness I treat my beloved Martha. And to this Goddess, swollen earth, I took the plow! Martha, we are fortunate indeed that our neighbors are gentle people, or I would be hanged now, or stoned to death like the wicked in the old days. *Ich hot iere Gotterin awgepockt*: I raped their Goddess!"

Martha burst into tears. When Aaron stepped forward to comfort her, she struck his chest with her balled fists. "Stoltz, I wed you despite your beer-drinking from cans at the Singing, though you play a worldly guitar and sing the English songs, though people told me you drove your gay Uncle Amos' black-bumpered Ford before you membered to the district; still, house-Amish pure Old Order though my people are, I married you, from love and youngness and girlish ignorance. But I do not care, even in this wilderness you've brought us to in that big English ship, to hear such vileness spoke out boldly. Leave me alone."

"I'll not."

"You'd best," she said. "I'm sore offended in the lad I'm wifed to."

"Love, *Ich bin sorry,*" Aaron said. "The Book, though, says just what our neighbors told me: Ye shall know the truth, and the truth shall set you free. I have found the truth, the truth of our dark-skinned friends. I did not want to wound the ears of *da Oppel fuun mein Awk,* apple-of-mine-eye sweet Martha; but I must speak out the truth."

"It is not good enough," Martha sobbed, "that you accept this brown-

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skinned, jewel-bedizzened woman-god; but you must make love to her; and I, wed to you by the Book, nine months gone with *Kinndt,* am to make no fuss."

"I loved the Mother-god with the plow, and accidentally," Aaron bellowed. *"Haagott!* woman; have you no funny?"

"I will birth our child in my lap from laughing," Martha said, weeping. "Aaron, do what you will. I can hardly walk home to my Mem to bear a son in my girlhood bedroom. We are like *Awduum uuu Ayf,* like you said; but the serpent in this Eden pleases me not."

"When I spoke of colts, and the borning of them," Aaron said, "I forgot me that mares are more sensible than human women. Martha, *liebe* Martha, you wed a man when you married me. All your vapors are naught against my having seen the light. If to stay here, on this land already watered with my hard sweat, I had to slaughter cattle in sacrifice to the Mother, I'd pick up the knife gladly, and feel it no blasphemy against our God."

"Aaron Stoltz," Martha said, "I forbid you to lend honor to this god!"

Aaron sat. He unlaced his shoes and tugged them off. "Woman," he asked softly, "you forbid me? Martha, for all the love I bear you, there is one rule of our folk that's as holy as worship; and that's that the man is master in his house." He pulled off his black stockings and stood, barefoot, with callouses won on the black earth of his father's farm; dressed otherwise meetly as a deacon. "I will walk to Datura on my naked feet to show our friends I know my wrongdoing, that I have hurt the belly of the pregnant earth. I will tell Sarki Kazunzumi that I have seen his light; that my horses will be unshod as I am, that the Mother will not feel my plow again until the grasses spring, when her time will be accomplished."

Martha crossed her hands about her middle. "Ach, Stoltz," she said. "Our *Buu iss reddi far geh,* I think. Today will be his birthday. Don't let your tenderness to the earth keep you from walking swiftly to Datura; and when you return, come in a wagon with the Sarki's ladies, who understand midwifery. I think they will find work here."

"I will hurry, Mother," Aaron promised. ◻

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Subversive

"Subversive" is, in essence, a negative term — it means simply "against the existent system." It doesn't mean subversives all agree...

by Mack Reynolds

Illustrated by Schoenherr

■ The young man with the brown paper bag said, "Is Mrs. Coty in?"

"I'm afraid she isn't. Is there anything I can do?"

"You're Mr. Coty? I came about the soap." He held up the paper bag.

"Soap?" Mr. Coty said blankly. He was the epitome of mid-aged husband complete to pipe, carpet slippers and office-slump posture.

"That's right. I'm sure she told you about it. My name's Dickens. Warren Dickens. I sold her—"

"Look here, you mean to tell me in this day and age you go around from door to door peddling soap? Great guns, boy, you'd do better on unemployment insurance. It's permanent now."

Warren Dickens registered distress. "Mr. Coty, could I come in and tell you about it? If I can make the first delivery to you instead of Mrs. Coty, shucks, it'll save me coming back."

Coty led him back into the living room, motioned him to a chair and settled into what was obviously his own favorite, handily placed before the telly. Coty said tolerantly, "Now then, what's this about selling soap? What kind of soap? What brand?"

"Oh, it has no name, sir. That's the point."

The other looked at him.

"That's why we can sell it for three cents a cake, instead of twenty-five." Dickens opened the paper bag and fished out an ordinary enough looking cake of soap and handed it to the older man.

Mr. Coty took it, stared down at it, turned it over in his hands. He was still blank. "Well, what's different about it?"

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"There's nothing different about it. It's the same as any other soap."

"I mean, how come you sell it for three cents a cake, and what's the fact it has no name got to do with it?"

Warren Dickens leaned forward and went into what was obviously a strictly routine pitch. "Mr. Coty, have you ever considered what you're buying when they nick you twenty-five cents on your credit card for a bar of soap in an ultra-market?"

There was an edge of impatience in the older man's voice. "I buy soap!"

"No, sir. That's your mistake. What you buy is a telly show, in fact several of them, with all their expensive comedians, singers, musicians, dancers, news commentators, network vice presidents, and

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all the rest. Then you buy fancy packaging. You'll note, by the way, that our product hasn't even a piece of tissue paper wrapped around it. Fancy packaging designed by some of the most competent commercial artists and motivational research men in the country. Then you buy distribution. From the factory all the way to the retail ultra-market where your wife shops. And every time that bar of soap goes from one wholesaler or distributor to another, the price roughly doubles. You also buy a brain trust whose full time project is to keep you using their soap and not letting their competitors talk you into switching brands. The brain trust, of course, also works on luring away the competitor's customers to their product. Shucks, Mr. Coty, practically none of that twenty-five cents you spend to buy a cake of soap goes for soap. So small a percentage that you might as well forget about it."

Mr. Coty was obviously taken aback. "Well, how do I know this nameless soap you're peddling is, well, any good?'

Warren Dickens sighed deeply, and in such wise that it was obvious that he had so sighed before. "Sir, there is no difference between soaps. Oh, they might use a slightly different perfume, or tint it a slightly different color, but for all practical purposes common hand soap, common bath soap, is soap, period. All the stuff the copy writers dream up about secret ingredients and health for your skin, and cosmetic qualities, and all the rest, is Madison Avenue gobbledygook and applies as well to one brand as another. As a matter of fact, often two different soap companies, supposedly keen competitors, and using widely different advertising, have their products manufactured in the same plant."

Mr. Coty blinked at him. Shifted in his chair. Rubbed his chin as though checking his morning shave. "Well . . . well, then where do you get *your* soap?"

"The same place. We buy in fantastically large lots from one of the gigantic automated soap plants."

Mr. Coty had him now. "Ah, ha! Then how come you sell it for three cents a cake, instead of twenty-five?"

"I've been telling you. Our soap doesn't even have a name, not to mention an advertising budget. Far from spending fortunes redesigning our packaging every few months in attempts to lure new customers, we don't package the stuff at all. It comes to you, in the simplest possible wrapping, through the mails. A new supply every month. Three cents a cake. No middlemen, no wholesalers, distributors. No nothing except soap at three cents a cake."

Mr. Coty leaned back in his chair. "I'll be darned." He thought it over. "Listen, do you sell anything besides soap?"

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"Not right now, sir. But soap flakes are coming up next week and I think we'll be going into bread in a month or two."

"Bread?"

"Yes, sir, bread. Although we'll have to distribute that by truck, and have to have almost hundred per cent coverage in a given section before it's practical. A nickle a loaf."

"Five cents a loaf! You can't *make* bread for that much."

"Oh, yes we can. We can't advertise it, package it, and pay a host of in-betweens, is all. From the bakery to you, period."

Mr. Coty seemed fascinated. He said, "See here, what's the address of your office?

Warren Dickens shook his head. "Sorry, sir. That's all part of it. We have no swanky offices with big, expensive staffs. We operate on the smallest of shoestrings. No brain trust. No complaint department. No public relations. No literature on how to beautify yourself. No nothing, except good soap at three cents a cake, plus postage. Now, if you'll sign this contract, we'll put you on our mailing list. Ten bars of soap a month, Mrs. Coty said. I brought this first supply so you could test it and see that the whole thing is bona fide."

Mr. Coty had to test it, but then he had to admit he couldn't tell any difference between the nameless soap and the product to which he was used. Eventually, he signed, made the first payment, shook hands with young Dickens and saw him to the door. He said, in parting, "I still wonder why you do this, rather than dragging down unemployment insurance like most young men fresh out of school."

Warren Dickens screwed up his face. This was a question that wasn't routine. "Well, I make approximately the same, if I stick to it and get enough contracts. And, shucks, they're not hard to get. And, well, I'm working, not just bumming on the rest of the country. I'm doing something, something useful."

Coty pursed his lips and shrugged. "It's been a long time since anybody cared about that." He looked after the young man as he walked down the walk.

Then he turned and headed for the phone, and ten years seemed to drop away from him. He lit the screen with a flick, dialed and said crisply, "That's him, Jerry. Going down the walk now. Don't let him out of your sight."

Jerry's face was in the screen but he was obviously peering down, from the helio-jet, locating the subject. "O.K., Tracy, I make him. See you later." His face faded.

The man who had called himself Mr. Coty, dialed again, not bothering to light the screen. "All right," he said. "Thank Mrs. Coty and let her come home now."

Frank Tracy worked his way down an aisle of automated phono-

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typers and other office equipment. The handful of operators, their faces bored, periodically strolled up and down, needlessly checking that which seldom needed checking.

He entered the receptionist's office, flicked a hand at LaVerne Sandell, one of the few employees it seemed impossible to automate out of her position, and said, "The Chief is probably expecting me."

"That he is. Go right in, Mr. Tracy."

"I'm expecting a call from one of the operatives. Put it through, eh LaVerne?"

"Righto."

Even as he walked toward the door to the sanctum sanctorum, he grimaced sourly at her. "*Righto*, yet. Isn't that a bit on the maize side? Doesn't sound very authentic to me."

"I can see you don't put in your telly time, Mr. Tracy. Slang goes in cycles these days. They simply don't dream up a whole new set of expressions every generation anymore because everybody gets tired of them so soon. Instead, older periods of idiom are revived. For instance, scram is coming back in."

He stopped long enough to look at her, frowning. "Scram?"

She took him in quizzically, estimating. "Possibly *dust*, or *get lost*, was the term when you were a boy."

Tracy chuckled wryly, "Thanks for the compliment, but I go back to the days of *beat it*."

In the inner office the Chief looked up at him. "Sit down, Frank. What's the word? Another exponent of free enterprise, prehistoric style?"

Frank Tracy found a chair and began talking even while fumbling for briar and tobacco pouch. "No," he grumbled. "I don't think so, not this time. I'm afraid there might be something more to it."

His boss leaned back in the massive old-fashioned chair he affected and patted his belly, as though appreciative of a good meal just finished. "Oh? Give it all to me."

Tracy finished lighting his pipe, flicked the match out and put it back in his pocket, noting that he'd have to get a new one one of these days. He cleared his throat and said, "Reports began coming in of house to house canvassers selling soap for three cents a bar."

"*Three cents a bar?* They can't manufacture it for that. Will the stuff pass the Health Department?"

"Evidently," Tracy said wryly. "The salesman claimed it's the same soap as reputable firms peddle."

"Go on."

"We had to go to a bit of trouble to get a line on them without raising their suspicion. One of the boys lived in a neighborhood that was being canvassed for new customers and his wife had signed up. So I took her place when the salesman arrived with her first delivery —they deliver the first batch. I let

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him think I was Bob Coty and questioned him, but not enough to raise his suspicions."

"And?"

"An outfit selling soap and planning on branching into bread and heavens knows what else. No advertising. No middlemen. No nothing, as the salesman said, except standard soap at three cents a bar."

"They can't package it for that!"

"They don't package it at all."

The Chief raised his chubby right hand and wiped it over his face in a stereotype gesture of resignation. "Did you get his home office address? Maybe there's some way of buying them out—indirectly, of course."

"No, sir. It seemed to be somewhat of a secret."

The other's eyes widened. "Ridiculous. You can't hide anything like that. There's a hundred ways of tracking them down before the day is out."

"Of course. I've got Jerome Wiseman following him in a heliojet. No use getting rough, as yet. We'll keep it quiet. . . . assuming that meets with your approval."

"You're in the field, Frank. You make the decisions."

The phone screen had lighted up and LaVerne's piquant face faded in. "The call Mr. Tracy was expecting from Operative Wiseman."

"Put him on," the Chief said, lacing his plump fingers over his stomach.

Jerry's face appeared in the screen. He was obviously parked on the street now. He said, "Subject has disappeared into this office building, Tracy. For the past fifteen minutes he's kinda looked as though the day's work was through and since this dump could hardly be anybody's home, he must be reporting to his higher-up."

"Let's see the building," Tracy said.

The portable screen was directed in such manner that a disreputable appearing building, obviously devoted to fourth-rate businesses, was centered.

"O.K.," Tracy said. "I'll be over. You can knock off, Jerry. Oh, except for one thing. Subject's name is Warren Dickens. Just for luck, get a complete dossier on him. I doubt if he's got a criminal or subversive record, but you never know."

Jerry said, "Right," and faded.

Frank Tracy came to his feet and knocked the rest of his pipe out into the gigantic ashtray on his boss' desk. "Well, I suppose the next step's mine."

"Check back with me as soon as you know anything more," the Chief said. He wheezed a sigh as though sorry the interview was over and that he'd have to go back to his desk chores, but shifted his bulk and took up a sheaf of papers.

Just as Tracy got to the door, the Chief said, "Oh, yes. Easy on the rough stuff, Tracy. I've been hearing some disquieting reports about some of the overenthusiastic bully-

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boys on your team. We wouldn't want such material to get in the telly-casts."

Lard bottom, Tracy growled inwardly as he left. Did the Chief think he liked violence? Did anyone in his right mind like violence?

Frank Tracy looked up at the mid-century type office building. He was somewhat surprised that the edifice still remained. Where did the owners ever find profitable tenants? What business could be so small these days that it would be based in such quarters? However, here it was.

The lobby was shabby. There was no indication on the list of tenants of the firm he was seeking, nor was there a porter. The elevator was out of repair.

He did it the hard way, going from door to door, entering, hat in hand, apologetically, and saying, "Pardon me. You're the people who sell the soap?" They kept telling him no until he reached the third floor and a door to an office even smaller than usual. It was lettered *Freer Enterprises* and even as he knocked and entered, the wording rang a bell.

There was only one desk but it was efficiently equipped with the latest in office gadgetry. The room was quite choked with files and even a Mini-IBM tri-unit. The man behind the desk was old-fashioned enough to wear glasses, but otherwise seemed the average aggressive executive type you expected to meet in these United States of the Americas. He was possibly in his mid-thirties and one of those alert, over-eager characters irritating to those who believe in taking matters less than urgently.

He looked up and said snappily, "What can I do for you?"

Tracy dropped into an easy-going characterization. "You're the people who sell the soap?"

"That is correct. What can I do for you?"

Tracy said easily, "Why, I'd like to ask you a few questions about the enterprise."

"To what end, sir? You'd be surprised how busy a man I am."

Tracy said, "Suppose I'm from the Greater New York *News-Times* looking for a story?"

The other tapped a finger on his desk impatiently. "Pardon me, but in that case I would be inclined to think you a liar. The *News-Times* knows upon which side its bread is spread. Its advertisers include all the soap companies. It does not dispense free advertising through its news columns."

Tracy chuckled wryly. All right. Let's start again. He brought forth his wallet, flicked through various identification cards until he found the one he wanted and presented it. "Frank Tracy is the name," he said. "Department of Internal Revenue. There seems to be some question as to your corporation taxes."

"Oh," the other said, obviously taken aback. "Please have a chair."

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He read the authentic looking, but spurious credentials. Tracy took the proffered chair and then sat and looked at the other as though it was his turn.

"My name is Flowers," the Freer Enterprises man told him, nervously. "Frederic Flowers. Frankly, this is my first month at the job and I'm not too well acquainted with all the ramifications of the business." He moistened his lips. "I hope there is nothing illegal—" He let the sentence fade away.

Tracy reclaimed his false identity papers and put them back into his wallet before saying easily, "I really couldn't say, as yet. Let's have a bit of questions and answers and I'll go further into the matter."

Flowers regained his confidence. "No reason why not," he said quickly. "So far as I know, all is above board."

Frank Tracy let his eyes go about the room. "Why are you established, almost secretly, you might say, in this business backwoods of the city?"

"No secret about it," Flowers demurred. "Merely the cheapest rent we could find. "We cut costs to the bone, and then shave the bone."

"Um-m-m. I've spoken to one of your salesmen, a Warren Dickens, and I suppose he gave me the standard sales talk. I wonder if you could elaborate on your company's policies, its goals, that sort of thing."

"Goals?"

"You obviously expect to make money, somehow or other, though I don't see that peddling soap at three cents a bar has much of a future. There must be some further angle."

Flowers said, "Admittedly, soap is just a beginning. Among other things, it's gives us a mailing list of satisfied customers. Consumers who can then be approached for future purchases."

Frank Tracy relaxed in his chair, reached for pipe and tobacco and let the other go on. But his eyes had narrowed, coldly.

Flowers wrapped himself up in his subject. "Mr. Tracy, you probably have no idea of the extent to which the citizens of Greater America are being victimized. Let me use but one example." He came quickly to his feet, crossed to a small toilet which opened off the office and returned with a power-pack electric shaver which he handed to Tracy.

Tracy looked at it, put it back on the desk and nodded. "It's the brand I have," he said agreeably.

"Yes, and millions of others. What did you pay for it?"

Frank Tracy allowed himself a slight smirk. "As a matter of fact, I got mine through a discount outfit, only twenty-five dollars."

"*Only* twenty-five dollars, eh, when the retail price is supposedly thirty-five?" Flowers was triumphant. "A great bargain, eh? Well,

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let me give you a rundown, Mr. Tracy."

He took a quick breath. "True, they're advertised to retail at thirty-five dollars. And stores that sell them at that rate make a profit of fifty per cent. The regional supply house, before them, knocks down from forty to sixty per cent, on the wholesale price. Then the trade name distributor makes at least fifty per cent on the sales to the regional supply houses."

"Trade name distributor?" Tracy said, as though ignorant of what the other was talking about. "You mean the manufacturer?"

"No, sir. That razor you just looked at bears a trade name of a company that owns no factory of its own. It buys the razors from a large electrical appliances manufacturing complex which turns out several other name brand electric razors as well. The trade name company does nothing except market the product. Its budget, by the way, calls for an expenditure of six dollars on every razor for national advertising."

"Well, what are you getting at?" Tracy said impatiently.

Frederic Flowers had reached his punch line "All right, we've traced the razor all the way back to the manufacturing complex which made it. Mr. Tracy, that razor you bought at a discount bargain for twenty-five dollars cost thirty-eight cents to produce."

Tracy pretended to be dumfounded. "I don't believe it."

"It can be proven."

Frank Tracy thought about it for a while. "Well, even if true, so what?"

"It's a crime, that's so-what," Flowers blurted indignantly. "And that's where Freer Enterprises comes in. Very shortly, we're going to enter the market with an electric razor retailing for exactly one dollar. No name brand, no advertising, no nothing except a razor just as good as though selling for from twenty-five to fifty dollars."

Tracy scoffed his disbelief. "That's where you're wrong. No electric razor manufacturer would sell to you. They'd be cutting their own throats."

The Freer Enterprises official shook his head, in scorn. "That's where *you're* wrong. The same electric appliance manufacturer who produced that razor there will make a similar one, slightly different in appearance, for the same price for us. They don't care what happens to their product once they make their profit from it. Business is business. We'll be at least as good a customer as any of the others have ever been. Eventually, better, since we'll be getting electric razors into the hands of people who never felt they could afford one before."

He shook a finger at Tracy. "Manufacturers have been doing this for a long time. I imagine it was the old mail-order houses that started it. They'd get in touch with a manufacturer of, say, typewriters,

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or outboard motors, or whatever, and order tens of thousands of these, not an iota different from the manufacturer's standard product except for the nameplate. They'd then sell these for as little as half the ordinary retail price."

Tracy seemed to think it over for a long moment. Eventually he said, "Even then you're not going to break any records making money. Your distribution costs might be pared to the bone, but you still have some. There'll be darn little profit left on each razor you sell."

Flowers was triumphant again. "We're not going to stop at razors, once under way. How about automobiles? Have you any idea of the disparity between the cost of production of a car and what they retail for?"

"Well, no."

"Here's an example. As far back as about 1930 a barge company transporting some brand-new cars across Lake Erie from Detroit had an accident and lost a couple of hundred. The auto manufacturers sued, trying to get the retail price of each car. Instead, the court awarded them the cost of manufacture. You know what it came to, labor, materials, depreciation on machinery—everything? Seventy-five dollars per car. And that was around 1930. Since then, automation has swept the industry and manufacturing costs per unit have dropped drastically."

The Freer Enterprises executive was now in full voice. "But even that's not the ultimate. After all, cars were selling for as cheaply as $425 then. Let's take some items such as aspirin. You can, of course, buy small neatly packaged tins of twelve for twenty-five cents but supposedly more intelligent buyers will buy bottles for forty or fifty cents. If the druggist puts out a special for fifteen cents a bottle it will largely be refused since the advertising conditioned customer doesn't want an inferior product. Actually, of course, aspirin is aspirin and you can buy it, in one hundred pound lots in polyethylene film bags, at about fourteen cents a pound, or in carload lots under the chemical name of acetylsalicilic acid, for eleven cents a pound. And any big chemical corporation will sell you U.S.P. grade Milk of Magnesia at about six dollars a ton. Its chemical name, of course, is magnesium hydroxide, or $Mg(OH)'$, and you'd have one thousand quarts in that ton. Buying it beautifully packaged and fully advertised, you'd pay up to a dollar twenty-five a pint in the druggist section of a modern ultra-market."

Tracy had heard enough. He said crisply, "All right, Mr. Flowers, of Freer Enterprises, now let me ask you something: Do you consider this country prosperous?"

Flowers blinked. Of a sudden, the man across from him seemed to have changed character, added considerable dynamic to his make-

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up. He flustered, "Yes, I suppose so. But it could be considerably more prosperous if—"

Tracy was sneering. "If consumer prices were brought down drastically, eh? Mr. Flowers, you're incredibly naïve when it comes to modern economics. Do you realize that one of the most significant developments, economically speaking, took place in the 1950s; something perhaps more significant than the development of atomic power?"

Flowers blinked again, mesmerized by the other's new domineering personality. "I . . . I don't know what you're talking about."

"The majority of employees in the United States turned from blue collars to white."

Flowers looked pained. "I don't—"

"No, of course you don't or you wouldn't be participating in a subversive attack upon our economy, which, if successful, would lead to the collapse of Western prosperity and eventually to the success of the Soviet Complex."

Mr. Flowers gobbled a bit, then gulped.

"I'll spell it out for you," Tracy pursued. "In the early days of capitalism, back when Marx and Engels were writing such works as *Capital*, the overwhelming majority of the working class were employed directly in production. For a long time it was quite accurate when the political cartoonists depicted a working man as wearing overalls and carrying a hammer or wrench. In short, employees who got their hands dirty, outnumbered those who didn't.

"But with the coming of increased mechanization and eventually automation and the second industrial revolution, more and more employees went into sales, the so-called service industries, advertising and entertainment which has become largely a branch of advertising, distribution, and, above all, government which in this bureaucratic age is largely a matter of regulation of business and property relationships As automation continued, fewer and fewer of our people were needed to produce all the commodities that the country could assimilate under our present socio-economic system. And I need only point out that the average American *still* enjoys more material things than any other nation, though admittedly the European countries, and I don't exclude the Soviet Complex, are coming up fast."

Flowers said indignantly, "But what's this charge that I'm participating in a subversive—"

"Mr. Flowers," Tracy overrode him, "let's not descend to pure maize in our denials of the obvious. If this outfit of yours, Freer Enterprises, was successful in its fondest dreams, what would happen?"

"Why, the consumers would be able to buy commodities at a fraction of the present cost!"

Tracy half came to his feet and

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pounded the table with fierce emphasis. "*What would they buy them with? They'd all be out of jobs!*"

Frederic Flowers bug-eyed him.

Tracy sat down again and seemingly regained control of himself. His voice was softer now. "Our social system may have its strains and tensions, Mr. Flowers, but it works and we don't want anybody throwing wrenches in its admittedly delicate machinery. Advertising is currently one of the biggest industries of the country. The entertainment industry, admittedly now based on advertising, is gigantic. Our magazines and newspapers, employing hundreds of thousands of employees from editors right on down to newsstand operators, are able to exist only through advertising revenue. Above all, millions of our population are employed in the service industries, and in distribution, in the stock market, in the commodity markets, in all the other branches of distribution which you Freer Enterprises people want to pull down. A third of our working force is now unemployed, but given your way, it would be at least two thirds."

Flowers, suddenly suspicious, said, "What has all this to do with the Department of Internal Revenue, Mr. Tracy?"

Tracy came to his feet and smiled ruefully, albeit a bit grimly. "Nothing," he admitted. "I have nothing at all to do with that department. Here is my real card, Mr. Flowers."

The Freer Enterprises man must have felt a twinge of premonition even as he took it up, but the effect was still enough to startle him. "Bureau of Economic Subversion!" he said.

"Now then," Tracy snapped. "I want the names of your higher ups, and the address of your central office, Flowers. Frankly, you're in the soup. As you possibly know, our hush-hush department has unlimited emergency powers, being answerable only to the President."

"I . . . I've never even heard of it," Flowers stuttered. "But—"

Tracy held up a contemptuous hand. "Many people haven't," he said curtly.

Frank Tracy hurried through the outer office into La Verne Sandell's domain, and bit out to her, "Tell the Chief I'm here. Crisis. And immediately get my team together, all eight of them. Heavy equipment. Have a jet readied. Chicago. The team will rendezvous at the airport."

LaVerne was just as crisp. "Yes, sir." She began doing things with buttons and switches.

Tracy hurried into the Chief's office and didn't bother with the usual amenities. He snapped, "Worse than I thought, sir. This outfit is possibly openly subversive. Deliberately undermining the economy."

His superior put down the report he was perusing and shifted his

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bulk backward. "You're sure? We seldom run into such extremes."

"I know, I know, but this could be it. Possibly a deliberate program. I've taken the initiative to have Miss Sandell summon my team."

"Now, see here, Frank—" The bureau head looked at him anxiously.

Tracy said, impatience there, "Chief, you're going to have to let your field men use their discretion. I tell you, this thing is a potential snowball. I'll play it cool. Arrange things so that there'll be no scandal for the telly-reporters. But we've got to chill this one quickly, or it'll be on a coast to coast basis before the year is out. They're even talking about going into automobiles."

The Chief winced, then said unhappily, "All right, Tracy. However, mind what I said. Curb those roughnecks of yours."

It proved considerably easier than Frank Tracy had hoped for. Adam Moncure's national headquarters turned out to be in a sparsely settled area not far from Woodstock, Illinois. The house, in the passé ranch style, must have once been a millionaire's baby, what with an artificial fishing lake in the back, a kidney shaped swimming pool, extensive gardens and an imposing approach up a corridor of trees.

"Right up to the front door," Tracy growled to the operative driving the first hover-car of their two-vehicle expedition. "The quicker we move, the better." He turned his head to the men in the rear seat. "We five will go in together. I don't expect trouble, they'll have had no advance warning. I made sure of that. Jerry has equipment in his car to blanket any radio sending. We'll take care of phones in the house. No rough stuff, we want to talk to these people."

One of the men growled, "Suppose they start shooting?"

Tracy snorted. "Then shoot back, of course. But just don't you start it. I shouldn't have to tell you these things."

"Got it," one of the others said. He shifted his shoulders to loosen the .38 Recoilless in its holster.

At the ornate doorway, the cars, which had been moving fast, a foot or so off the ground, came to a quick halt, settled, and the men disgorged, guns in hand.

Tracy called to the occupants of the other vehicle, "On the double. Surround the house. Don't let anybody leave. Come on, boys."

They scurried down the flagstone walk, banged on the door. It was opened by a houseman who stared at them uncomprehendingly.

"The occupants of this establishment are under arrest," Tracy snapped. He flashed a gold badge. "Take me to Adam Moncure." He turned to his men and gestured with his head. "Take over, boys. Jerry, you come with me."

The houseman was terrified, but

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not to the point of being unable to lead them to a gigantic former living room, now converted to offices.

There was an older man, and four assistants. All in shirt sleeves in concession to the mid-western summer, none armed from all Tracy could see. They looked up in surprise, rather than dismay. The older man snapped, "What is the meaning of this intrusion?"

Jerry chuckled sourly.

Frank Tracy said, "You're all under arrest. Jerry, herd these clerks, or whatever they are, into some other room. Get any other occupants of the house together, too. And watch them carefully, confound it. Don't underestimate these people. And make a search for secret rooms, cellars, that sort of thing."

"Right," Jerry growled.

The older of the five Freer Enterprises men was on his feet now. He was a thin, angry faced type, gray of hair and somewhere in his sixties. "I want to know the meaning of this!" he roared.

"Adam Moncure?" Tracy said crisply.

"That is correct. And to what do I owe this cavalier intrusion into my home and place of business?"

Jerry, at pistol point, was herding the four assistants from the room, taking the houseman along with them.

Tracy looked at Moncure, speculatively, then dipped into his pockets for pipe and tobacco. He gestured to a chair with his head. "Sit down, Mr. Moncure. The jig is up."

"The *jig*?" the other blurted in a fine rage. "I insist—"

"O.K., O.K., you'll get your explanation." Tracy sat down on a couch himself and sized up the older man, even as he lit his pipe.

Moncure, still breathing heavily in his indignation, took control of himself well enough to be seated. "Well, sir?" he bit out.

Tracy said curtly, "Frank Tracy, Bureau of Economic Subversion."

"Bureau of Economic Subversion!" Moncure said indignantly. "What in the name of all that's holy is the Bureau of Economic Subversion?"

Tracy pointed at him with the pipe stem. "I'll ask a few questions first, please. How many branches of your nefarious outfit are presently under operation?"

The other glared at him, but Tracy merely returned the pipe to his mouth and glowered back.

Finally Moncure snapped, "There is no purpose in hiding any of our affairs. We have opened preliminary offices only in Chicago and New York. Freer Enterprises is but in its infancy."

"Praise Allah for that," Tracy muttered sarcastically.

"And thus far we have dealt only in soap. However, as our organization gets under way we plan to branch out into a score,

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and ultimately hundreds of products."

Tracy said, "You can forget about that, Moncure. Freer Enterprises comes to a halt as of today. Do you realize that your business tactics would lead to a complete collapse of gainful employment and eventually to a depression such as this nation has never seen before?"

"Exactly!" Moncure snapped in return.

It was Tracy's turn to react. His eyes widened, then narrowed. "Do you mean that you are deliberately attempting to undermine the economy of the United States of the Americas? Remember, Mr. Moncure, you are under arrest and anything you say may be held against you."

"Undermine it!" Moncure said heatedly. "Bring it crashing to the ground is the better term. There has never been such an abortion developed in the history of political economy."

He came to his feet again and began storming up and down the room. "A full three quarters of our employed working at nothing jobs, gobblydygook jobs, non-producing jobs, make-work jobs, red-tape bureaucracy jobs. At a time when the nation is supposedly in a breakneck economic competition with the Soviet Complex, we put our best brains into advertising, entertainment and sales, while they put theirs into science and industry."

He stopped long enough to shake an indignant finger at the surprised Tracy. "But that isn't the worst of it. Have you ever heard of planned obsolescence?"

Tracy acted as though on the defensive. "Well . . . sure . . ."

"In the Soviet Complex, and, for that matter, in Common Europe and other economic competitors of ours, they simply don't believe in planned obsolescence and all its related nonsense. Razor blades, everywhere except in this country, don't go dull after two or three shaves. Cars don't fall apart after two or three years, or even become so out of style that the owner feels that he's losing status by being seen in it, the owners expect to keep them half a lifetime. Automobile batteries don't go to pieces after eighteen months, they last for a decade. And on and on!"

The old boy was really unwinding now. "Nor is even that the nadir of this socio-economic hodgepodge we've allowed to develop, this economy of production for sale, rather than production for use." He stabbed with his finger. "I think one of the best examples of what was to come was to be witnessed way back at the end of the Second War. The idea of the ball-bearing pen was in the air. The first one to hurry into production gave his pen a tremendous build-up. It had ink enough to last three years, it would make many carbon copies, you could use it under water. And so on and so forth. It

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cost fifteen dollars, and there was only one difficulty with it. It wouldn't write. Not that that made any difference because it sold like hotcakes what with all the promotion. He wasn't interested in whether or not it would write, but only in whether or not it would sell." Moncure threw up his hands dramatically. "I ask you, can such an economic system be taken seriously?"

"What's your point?" Tracy growled dangerously. He'd never met one this far out, before.

"Isn't it obvious? Continue this ridiculous economy and we'll lose the battle for men's minds. You can't have an economic system that allows such nonsense as large scale unemployment of trained employees, planned obsolescence, union featherbedding, and an overwhelming majority of those who are employed wasting their labor on unproductive employment."

Tracy said, "Then if I understand you correctly, Freer Enterprises was deliberately organized for the purpose of undermining the economy so that it will collapse and have to be reorganized on a different basis."

"That is *exactly* correct," Moncure said defiantly. "I am devoting my whole fortune to this cause. And there is nothing in American law that prevents me from following through with my plans."

"You're right there," Tracy said wryly. "There's nothing in American law that prevents you. However, you see, I have no connection whatsoever with the American government." He slipped the gun from its holster.

Frank Tracy made his way wearily into LaVerne's domain. She looked up from the desk. "Everything go all right, Mr. Tracy?"

"I suppose so. Tell Comrade Zotov that I'm back from Chicago, please."

She clicked switches, said something into an inner-office communicator, then looked up again. "He'll see you immediately, Mr. Tracy."

Pavel Zotov looked up from his endless paperwork and wheezed the sigh of a fat man. He correctly interpreted the expression of his field operative. "Pour us a couple of drinks, Frank, or would you rather have it *Frol*, today?"

His best field man grunted as he walked over to the bar. "Vodka, eh? *Chort vesmiot* how tired one can become of this everlasting bourbon." He reached into the refrigerator compartment and brought forth a bottle of iced Stolichnaya. He poured two three-ounce charges and brought them back to his bureau chief's desk.

They toasted silently, knocked back the colorless spirit. Pavel Zotov said, "Well, Frol?"

The man usually called Frank Tracy said, "The worst case yet. This one had quite a clear picture of the true situation. He saw the necessity—given *their* viewpoint,

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of course—of getting out of the fantastic rut their economy has fallen into." He ran his hand over his mouth in a gesture of weariness. "Chief, do you have any idea of how long it would take us to catch up to them, if we ever did, if they really turned this economy on full blast, as an alternative to their present foul-up?"

"That's why we're here," the Chief said heavily. "What did you do?"

The man sometimes called Tracy told him.

Zotov winced. "I thought I ordered you—"

"You did," the man called Tracy told him curtly, "but what alternative was there? The fire will completely destroy the records. I have the names and addresses of all the others connected with Freer Enterprises. We'll have to arrange car accidents, that sort of thing."

The fat man's lips worked. "We can't get by with this indefinitely, Frol. With such blatant tactics, sooner or later their C.I.A. or F.B.I. is going to get wind of us."

Tracy came to his feet angrily. "What alternative have we? We've been sent over here to do a job. We're doing it. If we're caught, who knows better than we that we're expendable? If you don't mind, I'm going on home."

As he left the office, through the secret door that led through the innocuous looking garage, the man they called Frank Tracy was inwardly thinking, "Zotov might be my superior, and a top man in the party, but he's too soft for this job. Perhaps I'd better send a report back to Moscow on him." ◻

IN TIMES TO COME

The January issue features a yarn by Gordon Dickson—"The Hard Way"—concerning the learning process. "Civilization" is a somewhat tricky thing to define; the Tribesman sees the Barbarian as Evil and the Barbarian sees the Tribesman as "a gutless slave." And it makes a Citizen somewhat incomprehensible to the hard, rough and courageous Barbarian.

Now usually the Barbarian has to be taught the rudiments of Citizenship "the hard way." By force.

But there can be some very tricky forces indeed—and in this case Dickson's alternative title for the yarn was "Watch that Worm."

You are also invited to study the "alien" alphabet emblazoned on the huge spaceship on the cover Jack Schoenherr did for the yarn.

The Editor.

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—And Devious the Line of Duty

Sometimes the most diligent and loyal thing an old man can do is fumble, drink beer, and let a young man get into trouble...

by Tom Godwin

Illustrated by Schelling

■ "We're almost there, my boy." The big, gray-haired man who would be Lieutenant Dale Hunter's superior—Strategic Service's Special Agent, George Rockford—opened another can of beer, his fifth. "There will be intrigue already under way when this helicopter sets down with us. Attempted homicide will soon follow. The former will be meat for me. You will be meat for the latter."

Rockford was smiling as he spoke; the genial, engaging smile of a fond old father. But the eyes, surrounded by laughter crinkles, were as unreadable as two disks of gray slate. They were the eyes of a poker player—or master con man.

"I don't understand, sir," Hunter said.

"Of course not," Rockford agreed. "It's a hundred light-years back to Earth. Here on Vesta, to make sure there *is* an Earth in the future, you're going to do things never dreamed of by your Terran Space Patrol instructors there. You'll be amazed, my boy."

Hunter said nothing but he felt

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a growing dislike for the condescending Rockford. Only a few weeks ago President Diskar, himself, had said: *For more than a century these truly valiant men of the Space Patrol have been our unwavering outer guard; have fought and died by legions, that Earth and the other worlds of the Terran Republic might remain free—*

"I suppose you know," Rockford said, "that there will be no more than four days in which to stop the Verdam oligarchy from achieving its long-time ambition of becoming big enough to swallow the Terran Republic."

"I know," Hunter answered.

Jardeen, Vesta's companion world was the key. Jardeen was large and powerful, with a space navy unsurpassed by that of any other single world. A large group of now-neutral worlds would follow Jardeen's lead and Jardeen's alliance with the Verdam People's Worlds would mean the quick end for the Terran Republic. But, if Jardeen could be persuaded to ally with the Terran Republic, the spreading,

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grasping arms of the Verdam octopus would begin to wither away—

Rockford spoke again:

"Val Boran, Jardeen's Secretary of Foreign Relations, is the man who will really make Jardeen's decision. I know him slightly. Since my public role is that of Acting Ambassador, he agreed—reluctantly—to come to Vesta so that the talks could be on a neutral world. With him will be Verdam's Special Envoy Sonig; a wily little man who has been working on Boran for several weeks. He seems to be succeeding quite well—here's a message I received from Earth early this morning."

Rockford handed him a sheet of the green Hyperspace Communications paper. The message was in code, with Rockford's scribbled translation beneath:

Intelligence reports Verdam forces already massed for attack in Sector A-13, in full expectation of Jardeen's alliance. Anti-Terran propaganda, stressing the New Jardeen Incident, being used in preparation for what will be their claim of "defensive action to protect innocent worlds from Terran aggression." Terran forces will be outnumbered five to one. The urgent necessity of immediate and conclusive counter measures by you on Vesta is obvious.

Hunter handed the paper back, thinking, *It's worse than any of us thought*, and wondering how Supreme Command could ever have entrusted such an important task to a beer-guzzling old man from Strategic Service—a branch so unknown that he had never even heard of it until his briefing the day before he left Earth.

He saw that they had left the desert behind and were going up the long slope of a mountain. "The meeting will be on this mountain?" he asked.

Rockford nooded. "The rustic Royal Retreat. Princess Lyla will be our hostess. Her mother and father were killed in an airplane accident a year ago and she was the only child. You will also get to meet Lord Narf of the Sea Islands, her husband-by-proxy, who regards himself as a rare combination of irresistible woman-killer and rugged man-among-men."

"Husband-by-proxy?" Hunter asked.

"The king worshiped his daughter and his dying request to her was that she promise to marry Lord Narf. Narf's father had been the king's closest friend and the king was sure that his old friend's son would always love and care for Lyla. Lyla dutifully, at once, married Narf by proxy, which is like a legally binding formal engagement under Vestan law Four days from now the time limit is up and they'll be formally married. Unless she should do the unprecedented thing of renouncing the proxy marriage."

Rockford drained the last of the beer from the can. "Those are the characters involved in our play. I have a plan. That's why I told Space Patrol to send me a brand-

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new second lieutenant—young, strong, fairly handsome—and expendable. I hope you can be philosophical about the latter.".

"Sir," Hunter said, unable to keep a touch of stiffness out of his tone, "it is not exactly unknown in the Space Patrol for a man to die in the line of duty."

"Ah . . . yes." Rockford was regarding him with disturbing amusement. "You are thinking, of course, of dying dramatically behind a pair of blazing blasters. But you will soon learn, my boy, that a soldier's duty is to protect the worlds he represents by whatever actions will produce the best results, no matter how unheroic those actions may be."

"Attention, please." It was the voice of the pilot. "We are now going to land."

Hunter preceded Rockford out of the helicopter and onto the green grass of a small valley, across which tall, red-trunked cloud trees were scattered. Pale gray ghost trees, with knobby, twisted limbs, grew thickly among the cloud trees. There was a group of rustic cabins, connected by gravel paths, and a much larger building which he assumed would be a meeting hall . . .

"Hello."

He turned, and looked into the brown eyes of a girl. Her green skirt and orange blouse made a gay splash of color, her red-brown hair was wind-tumbled and carefree about her shoulders, in her hand was a bouquet of bright spring flowers.

But there was no smile of spring in the dark eyes and the snub-nosed little face was solemn and old beyond its years.

"You're Lieutenant Hunter, aren't you?" she asked in the same low, quiet voice.

"Princess Lyla!" There seemed to be genuine delight in Rockford's greeting as he hurried over. "You're looking more like a queen every day!"

Her face lighted with a smile, making it suddenly young and beautiful. "I'm so glad to see you again, George—"

"Ah . . . good afternoon."

The voice was loud, unpleasantly gravelly. They turned, and Hunter saw a tall, angular man of perhaps forty whose pseudogenial smile was not compatible with his sour, square-jawed face and calculating little eyes.

He spoke to Rockford. "You're Ambassador Rockford, here to represent the Terran Republic, I believe." He jerked his head toward Princess Lyla, who was no longer smiling. "My wife, Princess Lyla."

"Oh, she and I have been friends since she was ten, Lord Narf."

"And this young man"—Narf glanced at Hunter—"is your aide, I presume. Lyla, did you think to send anyone after their luggage?"

A servant was already carrying their luggage—and cases of Rock-

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ford's beer—out of the helicopter. Hunter followed the other toward the cabins. Narf, in the lead, was saying:

". . . Ridiculously primitive here, now, but I'm having some decent furniture and well-trained servants sent up from my Sea Island estates . . ."

The cabin was large and very comfortable, as Rockford mentioned to Princess Lyla.

"I'm glad you like it," she said. "Val Boran and Envoy Sonig are already here and we'll meet for dinner in the central hall. I thought that if we all got acquainted in a friendly atmosphere like that, it might help a lot to . . ."

"That reminds me"—Narf glanced at his watch—"I promised this Boran he could have a discussion with me—Vesta-Jardeen tariff policies. I suppose he's already waiting. Come on, Lyla—it will do you no harm to listen and learn a bit about interplanetary business."

For a long moment she looked at Narf silently, her eyes thoughtful, then she said to Rockford, "If you will excuse us, please. And be prepared for Alonzo to come bounding in the minute he learns you're here."

She walked beside Narf to the door and out it, the top of her dark hair coming just even with his shoulder.

"And that," Rockford said as he settled down in the largest, softest chair, "was king-to-be Narf, whose business ability is such that all his inherited Sea Island estates are gone but the one Lyla saved for him and who owes a total of ten million monetary units, to everyone from call girls to yacht builders."

"And she is going to marry him?" Hunter asked. "Marry that jackass and let him bankrupt her kingdom?"

Rockford shrugged. "You may have noticed that she doesn't look the least bit happy about it—but she is a very conscientious young lady who regards it as her most solemn duty to keep the promise she made to her father. For her, there is no escape."

"But—"

"Your first duty will be to cultivate a friendship with her. I'm going to use her, and you, to get what I want."

"*Use* us?"

"Yes. One of the most rigid requirements of a Strategic Service man's character is that he be completely without one."

Rockford was asleep in his chair an hour later, three empty beer cans beside him. Hunter watched him, his doubt of Rockford's competence growing into a conviction. Rockford had spoken knowingly of his plan—and had done nothing but drink more beer. Now he was asleep while time—so limited and precious—went by. He hadn't even bothered to reply to Hunter's sug-

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gestion that perhaps he should call on Val Boran and counteract some of Envoy Sonig's anti-Terran propaganda.

Hunter came to a decision. If Rockford was still doing nothing when morning came, he would send an urgent message to Supreme Command

He went outside, to find a servant and learn how mail was handled.

"*Rook out!*"

Gravel flew as overgrown feet tried to stop, and something like a huge black dog lunged headlong around the corner and into his legs. He went to the ground head first over the animal, acutely aware as he went down of the fascinated interest on the face of a not-so-distant servant.

"I sorry, Rootenant."

He got up, to look down at the doglike animal. There was a concerned expression in its brown eyes and an apologetic grin on its face. He recognized it as one of the natives of the grim starvation world of Altair Four. The Altairians had emigrated to all sections of the galaxy, to earn a living in whatever humble capacity they could fill. Many were empathic.

"I run too fast to meet, Mr. Rockford, I guess. Are you hurt, Rootenant?"

He pulled a cloud tree needle out of his hand and looked grimly down into the furry face. "In the future, try to look where you're going."

"Oh, I rook, awr right. I just not see. My name is Aronzo, Rootenant, and I stay here awr the time and guard everything for Princess Ryra. I prease to meet you and I wirr run errands for you, and do things rike mair your retters, for candy or cookies, which I are not supposed to eat much of, but Princess Ryra say not too many wirr hurt me—"

"Mail letters?" Hunter's animosity vanished. "I'm sorry I was rude, Alonzo—all my fault. I may write a letter to my dear old mother tonight, and if you would mail it for me in the morning—"

Rockford left ahead of Hunter and it was a minute past the appointed time when Hunter reached the meeting hall. He heard Narf's loud voice inside:

". . . Boran must have stopped to watch the sunset. Told him I wanted everyone here on time—"

The low voice of Lyla said something and Narf said, "Not necessary for you to defend him, my dear. I made it plain to him."

A new voice spoke from behind Hunter:

"It seems I have annoyed Lord Narf."

He was a tall, black-eyed man, with the dark, saturnine face of an Indian. There was a strange, indefinable air of sadness about him which reminded Hunter of the sombre little Princess Lyla.

"You're Val Boran, sir?" he said. "I'm Lieutenant Hunter—"

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Inside, Narf sat at the head of the table. On his left was Lyla, then Rockford. On his right was a spidery little man of about fifty, his slick-back hair so tight against his skull that it gave his head the appearance of a weasel's. His lips were paper-thin under a long nose, like those of a dry and selfish old maid, but the round little eyes darting behind thick glasses were cold and shrewd and missed nothing. He would be Verdam's Special Envoy Sonig. Hunter appraised him as a man very dangerous in his own deceptive way.

A servant showed them to their places at the table. Rockford and Val Boran exchanged greetings. The moment everyone was seated, Narf said, "Dinner tonight will—"

"Excuse me," Lyla said, "but Mr. Sonig hasn't yet met—"

"Oh . . . the young fellow there—" Narf gestured with his hand. "Rockford's aide. Now, ring the chime, Lyla. Those forest stag steaks are already getting cold. I killed the beast myself, gentlemen, just this morning; a long-range running shot that required a bit more than luck . . ."

The dinner was excellent, but no one seemed to notice. Narf was absorbed in the story of his swift rise to eminence in the Vestan Space Guard. There were humorous incidents:

". . . Can't understand why, but I seem to attract women like a magnet. I'm strictly the masculine type of male and I approve of this but it can be a blasted nuisance when you're an ensign going up fast and your commander finds one of your blondes stowed away in your compartment . . ."

And there were scenes of tense drama:

". . . Made a boyhood vow that I'd never settle for anything less than to always be a man among men. Seem to have succeeded rather well. When I saw the crew was almost to the snapping point from battle tension I knew that as commander I'd have to set the example that would inspire .

Hunter recalled Rockford's words of a few hours before: "*Narf got to be commander, finally, but only because he was the son of the king's best friend. His record is very mediocre.*"

Princess Lyla tried three times to start a conversation of general interest and was drowned out by Narf each time. Sonig's pretense of being spellbound by Narf's stories was belied by the way his eyes kept darting from Rockford to Val Boran. Val's own attention kept shifting from Narf to the silent Lyla, whose downcast eyes betrayed her discouragement. She watched Val from under her eyelashes, to look away whenever their eyes met, and Hunter wondered if she was ashamed because Narf had given Sonig the seat of honor that should have belonged to Val.

Of course, Narf's own position at the head of the table was actually Lyla's.

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". . . So there's no substitute for competent, unwavering leadership," Narf was saying. "Received a citation for that one."

Sonig nodded appreciatively. "Your military record well illustrates the fact that the tensions of danger and battle can bring forth in a competent leader the highest kind of courage. But it seems to me that these same circumstances, if the leader is frightened or incompetent, can easily produce hysterical actions with disastrous consequences. Is this true, your lordship?"

Rockford was watching Sonig intently and Hunter saw that there was an eager anticipation in Sonig's manner.

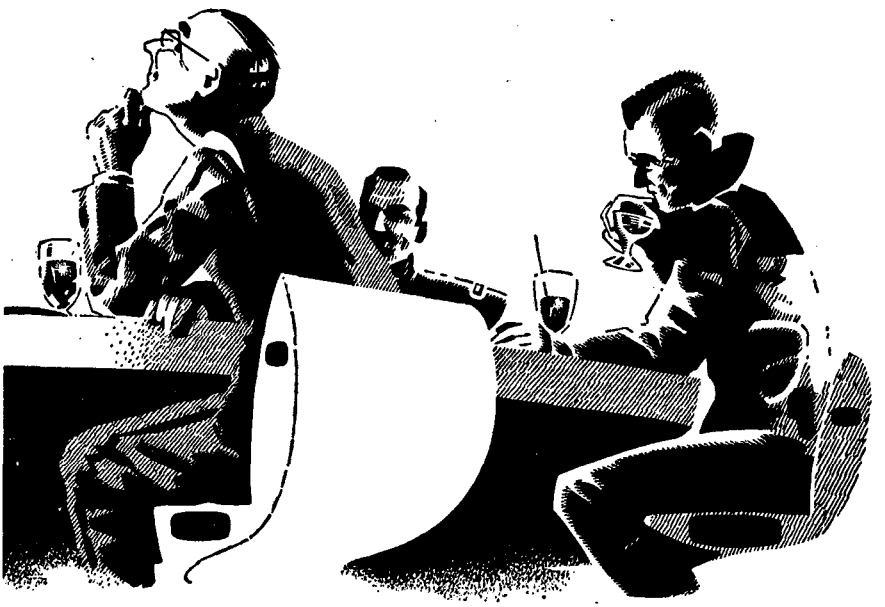
"You are quite right," Narf answered. "I've always had the ability to remain cool in any crisis. Very important. Let a commander get rattled and he may give any kind of an order. Like the New Jardeen Incident."

A frozen silence followed the last five words. Hunter thought, *So that's what the little weasel was fishing for . . .*

Rockford quietly laid down his fork. Val's face turned grim. Lyla looked up in quick alarm and said to Narf:

"Let's not—"

"Don't misunderstand me, gentlemen," Narf's loud voice went on. "*I* believe the commander of the Terran cruiser wouldn't have ordered it to fire upon the Verdam cruiser over a neutral world such



—AND DEVIOUS THE LINE OF DUTY

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as New Jardeen if he had been his rational self. Cold-war battle nerves. So he shot down the Verdam cruiser and its nuclear converters exploded when it fell in the center of Colony City. Force of a hydrogen bomb—forty thousand innocent people gone in a microsecond. Not the commander's fault, really—fault of the military system that failed to screen out its unstable officers."

"Yes, your lordship. But is it possible"—Sonig spoke very thoughtfully—"for a political power, which is of such a nature that it must have a huge military force to maintain its existence, to thoroughly screen all its officers? So many officers are required—Can there ever be any assurance that such tragedies won't occur again and again, until a majority of worlds combine in demanding an end to aggression and war?"

Rockford spoke to the grim Val: "I know, sir, that your sister was among the lost in Colony City. I am sorry. For the benefit of Mr. Sonig and Lord Narf, I would like to mention that the Verdam cruiser fired upon the Terran cruiser over neutral New Jardeen in open violation of Galactic Rule. An atmospheric feedback of the Verdam cruiser's own space blasters tore out its side and caused it to fall. The Terran cruiser never fired."

"But Mr. Rockford—" Sonig spoke very courteously. "Isn't it true that certain safety devices prevent atmospheric feedback?"

"They do—unless accidently or purposely disconnected."

Sonig raised his eyebrows. "You imply a created incident, sir?"

"It doesn't matter," Val Boran said. His tone was as grim as his face and it was obvious he did not believe Rockford's explanation. "Colony City is a field of fused glass, now, its people are gone, and no amount of debating can ever bring them back."

The dismal dinner was finally over. Rockford stopped outside the door of their cabin to fill and light his pipe.

"It was a profitable evening," he said to Hunter. "I can start planning in detail now—after a little beer, that is."

He'll go to sleep after he drinks his beer, Hunter thought, *and there will never be any plan unless I—*

Soft footsteps came up the path behind them. It was Princess Lyla.

"I want to apologize," she said, "I just told Val . . . Mr. Boran the same thing."

Her face was a pale oval in the starlight, her eyes dark shadows. "I'm sorry my husband mentioned the New Jardeen incident."

"That's all right, Lyla," Rockford said. "No harm was done."

"He's an ex-military man, and I guess it's his nature to be more forthright than tactful."

"You certainly can't condemn him for that," Rockford said. "In fact, he's an extraordinary teller of

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entertaining stories. It was a most enjoyable evening."

"And, in a way, it was," Rockford said when she was gone and they were in the cabin. He was seated in the softest chair, a can of beer in his hand, as usual.

Hunter thought of the way she had looked in the starlight and said, "Why did she let that windbag sit at the head of the table and ruin the meeting that she had arranged?"

"He'll soon be her husband—I suppose she feels she should be loyal to him."

"But—"

"But what?"

"Nothing. It's none of my business."

"Oh?" Rockford smiled in a way Hunter did not like. "You think so, eh?"

Hunter changed the subject. "Are you going to start talking to Boran to undo the damage Narf and Sonig have done?"

"It would be a waste of time, my boy. Val Boran's mind is already made up."

"Then what are you going to do?"

"Drink six cans of beer and go to sleep."

"I thought you had a plan."

"I have, a most excellent plan."

"What is it?"

"You'd scream like a banshee if you knew. You'll learn—if you manage to live that long."

Rockford was sound asleep an hour later, snoring gently. Hunter sat thinking, hearing the steady murmur of a voice coming from Val Boran's cabin. Sonig's voice—using every means of persuasion he could think of, at the moment capitalizing on the New Jardeen incident and Boran's withheld grief over the sister he had lost.

And the Terran Republic's representative was sprawled fat and mindless in a fog of beer fumes.

Hunter hesitated no longer. The fate of Earth and the Terran Republic hung in the balance and time was desperately limited—if there was now any time at all.

He took paper and pen and began the urgent message to Supreme Command, headed, TOP EMERGENCY. It would be sent via Hyperspace Communications from the city and would span the hundred light-years within seconds.

He was up before Rockford the next morning, and went out into the bright sunlight. He looked hopefully for Alonzo, not wanting to be seen mailing the letter in person. Rockford, despite his drunken stupors, could be shrewdly observant and he might deduce the contents of the letter before Supreme Command ever received it.

He was some distance from the cabin when he heard the pound of padded feet behind him.

"Rootenant," Alonzo had the grin of a genial canine idiot. "Do you want me to mair your retter to your dear ore mother?"

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"Yes, I have the letter right here."

"O.K. I got to hurry, because the mair hericopter reaves right away. I charge six fig cookies or three candy bars or—"

"Here—take it and run—and try not to slobber all over it."

They were served breakfast in the cabin. Afterward, Rockford went for a brief talk with Princess Lyla. He came back and settled down in the easy-chair, his pipe in his hand.

"Your morning's duty won't be at all unpleasant," he said. "The obnoxious and repulsive things will begin to happen to you later. Maybe this afternoon."

"What do you mean?"

"This morning you will go for a walk with Princess Lyla and discuss changing the Vestan Space Guard into a force along Terran Space Patrol lines. Narf is still in bed, by the way."

Rockford added, "I'll give you a bit of sage advice, for your own good—try not to fall in love with her."

Hunter and Princess Lyla sat together on the high hill, their backs against the red trunk of a cloud tree. On the mountain's slope to their right lay the dark and junglelike Tiger Forest—he wondered if it was true that the savage tree tigers never left its borders—while the toylike cabins of the camp were below them. The mountain's slope dropped on down to the deserts, beyond which were other mountains, far away and translucent azure.

"It was George who suggested we come up here," she said. "He knows I do that often when the responsibilities of being queen of a world—I'm such an ordinary and untalented person—become too much for me. I always feel better when I sit up here and look down on the mountains and deserts."

"Yes," he said politely.

"A ruling princess can be so alone," she said. "That's why I appreciate George's friendship so much—it's never because of any ulterior motive but because he likes me."

I'm going to use her, and you, to get what I want.

He looked at her, at the lines of sadness on the face that was too old for its years, felt the way she was so grateful to Rockford for what was only a cold-blooded pretense of friendship, and the dislike for Rockford increased. He could not force himself to speak civilly of Rockford so he changed the subject:

"I understand you wanted to talk to me about the Space Guard?"

"Yes. Even a neutral world can't feel safe these days and George suggested that."

"I'll be glad to help all I can. Of course, the change will require time."

"I can understand that. They say you Space Patrol officers begin training at sixteen, after passing

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almost impossible qualification tests."

"The tests can seem extremely difficult to a farm boy from Kansas. I—"

"Kansas?" Her eyes lighted with interest "My grandmother was from Kansas! She used to tell me about the green plains of grain in the spring, and how different they were from the deserts of Vesta . . ."

It was almost noon when he took her hand and helped her to her feet, realizing guiltily that they had talked all morning without ever getting back to the cold, dry facts of military efficiency.

"It was nice to talk up here this morning," she said. She looked down at the cabins and the shadow fell again across her face. "But nothing down there has been changed by it, has it?"

He held to her hand longer than was necessary as they went down the steep part of the hill. She did not seem to mind.

When they reached her cabin she said, "It's still a little while until lunch—time enough for you to give me a rough outline of the Space Guard change."

Everything inside the cabin was feminine. None of Narf's possessions were visible. There was a heavy door leading into Narf's half of the cabin, with a massive lock. Hunter wondered if it was left unlocked at night, thought of Narf's sour face and leering little eyes, and found the thought repulsive.

The answer to his conjecture came with the entrance of a servant as they seated themselves.

"By your leave, your highness," the servant said, bowing, "I came to make Lord Narf a key for that inner door."

"A key?" There was alarm in her tone. "But we're not married—not yet!"

A puzzled expression came to the man's face. "Lord Narf told me, your highness, that you had ordered the duplicate key made and given to him before evening. I found I could not do this without first borrowing your key for a pattern."

There was a frightened look in her eyes as they went to the door and back to the servant. "*No* . . . don't try to make a key!"

"Yes, your highness." The servant bowed and turned away.

A familiar gravelly voice spoke from behind them:

"Ah . . an unscheduled little meeting, I see!"

It was Narf, anger on his face, already within the doorway as the servant went out it.

"We were going to talk about the Space Guard," Lyla said in an emotionless tone. "Lieutenant Hunter has promised to show how Space Patrol methods will improve it and—"

"By a coincidence, Sonig and I were discussing military matters only a few minutes ago," Narf said. He looked at Hunter. "I'm afraid that Sonig and I agree that

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the Terran Space Guard is quite out of date, now. *The* fighting force of the galaxy is the Verdam's Peoples Guards."

Narf spoke to Lyla, "You may go ahead and talk with this lieutenant if you wish to, but it's a waste of time. I'm arranging to have Sonig send Peoples Guards officers here to supervise the rebuilding of the Space Guard.

"And now"—there was insinuation in Narf's tone as he spoke to Hunter—"I have to give Sonig a demonstration of my skill with weapons. He insists on it—he has heard of several of my modest feats."

Narf left the door open behind him so that by turning his head as he walked, he could see the two inside.

"I suppose I might as well go," Hunter said.

Lyla did not answer. She sat motionless, staring unseeingly before her, and he wondered if she was thinking of how very soon Narf would be king and his authority as great as hers.

She did not notice when he quietly left the room.

Rockford was waiting in the cabin, still in the easy-chair.

"Well," Rockford said, "what do you think of her?"

Hunter tried to keep the personal dislike out of his coldly formal reply:

"If you refer to your suggestion that I not make love to her, sir, I can assure you that such a suggestion was never necessary. I happen to have a code of ethics."

"I didn't say 'make love'. I said, 'fall in love'. That's quite ethical. Did you complete your discussion with her?"

"Well . . . no."

"You must do that this afternoon, then. Can't let anything as important as that be delayed."

Hunter stared at him, trying to find one small grain of sanity in Rockford's actions. The Verdam empire already had Jardeen within its grasp, and Vesta, and the end for Earth was inevitable. And Rockford slept, and drank beer, and regarded it as very important that the Vestan Space Guard discussions—of a change that Narf would never permit—be continued without delay.

He walked slowly into his own room. In the nightmare situation of frustration there was one single sane and stable conviction for his mind to cling to: Supreme Command would by now have received his message and shot back the reply that would relieve Rockford of his command. Perhaps it wasn't yet too late—

Then his mind reeled as a new conviction struck it.

There was a sheet of paper on his bed—a message.

His message!

. . . SITUATION EXTREMELY CRITICAL . . . VAL BORAN ALREADY CONVINCED BY

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ONIG'S PROPAGANDA . . . MUST REPORT ROCKFORD IS UTTERLY INCOMPETENT, HIS MIND AND WILL DESTROYED BY ALCOHOL . . . REPEAT: ROCKFORD IS DOING NOTHING, HIS MIND DESTROYED BY ALCOHOL . . .

The words screamed up at him and he felt the sickness of one who sees the last faint hope shattered and gone. All was lost, now . . .

He went outside, feeling a savage desire for violence rising above the sickness.

"Rootenant!" Alonzo came bounding to meet him and slid to a halt with his saucer feet scattering gravel and the idiotic grin on his face. "I mair your retter and you owe me six fig cook—"

It occurred to Hunter that it was not Alonzo that should be punished. He, Hunter, was the one who deserved execution for ever entrusting anything so important as the message to an imbecilic animal.

He said with cold distinctness: "The . . . letter . . . is . . . inside."

"Oh?" Alonzo blinked. "I sure mair something, awr right. After Mr. Rockford correct it."

"*Correct it?*"

"Oh, sure. Mr. Rockford, he up rong before you this morning to find me and say you are writing a retter rast night and I must bring it by for him to make awr your mistakes over again."

So Rockford was watching all the time, pretending to be in a drunken sleep . . .

"Rootenant—" Alonzo shifted his big feet impatiently. "You stirr owe me six fig—"

Hunter swung around and strode away, afraid he might decide to choke the animal after all. A culture of twenty worlds was the same as already destroyed, and he was held in a maddening quagmire of helplessness by a crafty alcoholic and a dog with the mind of a small child.

"Ah . . . my boy!" Rockford came out of the cabin, beaming as though nothing had ever happened. "Look to your left, among those ghost trees—Narf is demonstrating his quick-draw skill to Sonig. Narf is supposed to be a very dangerous man, you know."

Hunter looked, and saw Narf whipping up the blunt, ugly spread-beam blaster—known to soldiers as the Coward's Special, because at short range it could not miss and would always cripple and blind a man for life even though it would not always kill him. Sonig was standing by, nodding his weasel head and smiling in open admiration.

"Of course," Rockford said, "Sonig isn't mentioning the needle gun all Verdam envoys carry up their sleeve. He's flattering Narf's ego for a reason—he intends to have Vesta, as well as Jardeen, sewed up for the Verdam empire when he leaves here."

"And so far as I can see,"

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Hunter said coldly, "Sonig never is going to have anything vaguely resembling intelligent resistance to his plans."

"Ah, yes . . . so far as you can see," Rockford agreed amiably. "But you obey my order to take Lyla for another walk and everything will turn out all right. In fact, I'll speak to her about that right now."

Hunter stared after Rockford as he walked away. There could be no possible shred of doubt—Rockford was insane!

The breeze shifted and the voice of Narf came:

". . . Certainly no weapon for a timid man, this spread-beam blaster. Have to meet the enemy man-to-man at close range."

"In that respect, too," Sonig said, "you remind me of our great General Paluk. His skill in hand-to-hand combat was something that—"

"Rootenant—"

Hunter quivered and steeled himself.

"Rootenant—" Alonzo came to a flopping halt beside him. "I terr Princess Ryra and she say I are bad to be mad at you. So I not mad, even if you didn't give me my pay."

"Thank you," Hunter said acidly. "I was deeply disturbed by your resentment."

"Oh, I know, you don't rike me. But I think you not as mean as you act. But Rord Narf—he is. I terr you, he awready mad enough to kirr you."

"What? Lord Narf wants to kill me?"

"Oh, he know you hord Princess Ryra's hand awrmost awr the way down the hirr this morning. Mr. Sonig, he see you, and he run and terr Rord Narf and Mr. Boran, too."

"But I was only helping her down the hill."

"Rord Narf, he are going to say mean things about it to Princess Ryra, too. I know. He are awrways saying mean things to my Princess Ryra."

Alonzo sighed, a sound strangely humanlike in its sadness.

"Who wirr watch over my Princess Ryra after she marry Rord Narf? He said, 'The first thing to go around here wirr be that stupid brabber-mouth animar that are not worth what it costs to feed it.' I think maybe he are afraid that if he ever hit my Princess Ryra, I wirr kirr him." The brown eyes looked up at Hunter, and suddenly they were unlike he had ever seen them; cold with deliberate decision. "I wirr, too."

Hunter was still standing by the cabin, thinking of what Alonzo had said, when Rockford returned.

"I also stopped by to see Val Boran," Rockford said. "While you're off with Lyla, we'll go to the city. Lyla is giving us free access to the Royal Library and the records of a neutral world carry more weight than anything I could say. Not that it's going to change

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his mind any—but it will give me a chance to work on him in another way."

Rockford went into the cabin as Val Boran came up the path, Princess Lyla walking beside him. She was saying, ". . . And anything we have in the library is yours for the asking."

They were close enough for Hunter to see her expression as she looked up at Val and added with what seemed a touch of wistfulness, "I'll be glad to go in with you and Mr. Rockford and do what I can to help if you want me to."

"Lyla"—it was the grating voice of Narf who seemed to have the ability to materialize anywhere—"I'm sure the man knows his business. Besides, I want to talk to you about something as soon as I have finished my discussion with Mr. Sonig."

With that, Narf started on toward his cabin. Sonig, close behind him, paused long enough to bow to Lyla and say with the meaningless smile, "Good afternoon, Princess Lyla. Your husband was just demonstrating his marvelous skill with weapons. I would very much dislike"—the little eyes darted to Hunter and back again—"being the man who aroused his lordship's wrath."

Then Sonig followed Narf, with one last flickering glance at Hunter to see how the remark had fallen.

Rockford came out of the cabin with his brief case and said to Val, "Are we ready to go?"

"I just told Val"—Lyla spoke quickly—"that I would be glad to go along and help any way I can." The words were addressed to Rockford but her eyes were on Val, with the same wistful expression. "Do you want me to?"

Val answered her with cool, formal courtesy: "The librarian can find all the records we will need, Princess Lyla, without our interrupting your schedule for the day or your discussion with your husband. Thank you very much."

For an instant Lyla's face had the hurt expression of a child rebuffed without reason. Then she looked away and Val turned to Rockford and said, "I'm ready when you are, sir."

Lyla watched them walk away and she was still watching when the helicopter had lifted into the air and faded from sight.

Hunter hesitated, then spoke to her:

"I understand you want to talk more about the Space Guard, Princess Lyla?"

"*Princess* Lyla!" Her lips curled as she turned to face him and she seemed to spit the words at him in sudden, unexpected resentment. "I love the meaningless sound of my official figurehead title! It's so much better than being regarded as a living person with feelings that can be hurt!"

"But Princ . . . I mean—" He floundered, not quite sure what had caused her reaction.

She made a visible effort to com-

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pose herself. "I'm sorry," she said. "I suppose my . . . husband . . . is quite right; an immature female has no business trying to rule a world and the sooner the marriage is confirmed, the sooner a competent man can take over the job."

"No," he said. "I think—"

He decided that what he thought had better be left unsaid.

"I'll"—she looked toward the cabin she shared with Narf—"let you know when we can talk."

She went back toward the cabin, walking slowly. From inside Narf's half of it came the sound of Narf's voice as he spoke to Sonig:

". . . Of course, this collection of heads is nothing compared with what I have in the Sea Islands . . . but some interesting stories here . . . take that snow fox there . . ."

Hunter sighed, and saw that Lyla had stopped before her door, as though dreading to enter. Narf's voice droned on:

". . . Only wounded, so I finished it with a knife. Even with its heart half cut out, it still wanted to live . . . beautiful pelt . . . coat for Janalee, the strip-tease queen . . . always had a way with women—Lyla could tell you that . . . had my pick of hundreds but I'm letting her be my choice . . ."

He saw Lyla half lift her hand, as in some mute gesture of protest, then she turned and walked swiftly away; up the path that led into the ghost trees, and out of sight.

He waited, but she did not come back. He went into his cabin and moved about restlessly, hearing again Narf's sadism-and-sex boasting and seeing again how she turned and almost ran from it—

"*Rootenant!*"

Alonzo was panting, a look of frantic appeal in his eyes.

"Prease herp me . . . Princess Ryra . . she wirr die!"

He felt his heart lurch. "She's hurt?" he demanded, and was already on his way to the door.

"She are about to cry and she are going to where the tree tigers riv. They wirr kirr her—prease come with me!"

He asked no more questions but went out the door and up the path, Alonzo running ahead of him.

The ghost trees grew thinner as they went up the mountain's slope, and the blue-green fernlike trees of the tiger forest began to appear. They grew thicker and thicker, until the ground was black with their shadows and the midday sunlight was filtered out by the foliage overhead. Alonzo was trailing her, his nose to the ground, and Hunter hurried close behind him, watching for the red-and-white of the clothes she was wearing and hoping they would not find her too late.

They were deep in the forest when they found her.

She was standing motionless in the center of a clearing, facing away from him and looking as small and alone as a lost child. She seemed to be waiting . . .

He realized for the first time how

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alone she really was, with only a doglike alien, Alonzo, to love her or care what might happen to her, and with a future she could not bear to face. But Rockford had been wrong when he had said, *For her, there is no escape.*

There was escape for her. She had only to wait, as she was waiting now, and it would come in the windlike whisper of a tiger's rush through the grass behind her . . .

He hurried to her. She turned, and he saw the stains of tears now dry on her face and in her eyes the darkness of utter defeat.

"I was afraid you might get hurt, Lyla—"

Then, seemingly without volition on his part, he put his arms around her and she was clinging to him and crying in muffled sobs and trying to say something about, "*I didn't think anybody car d . . .*"

It was some time later, when her crying was finished, that he was reminded of the tigers by Alonzo:

"Rootenant . . . awr the time, some tigers are coming croser and croser. We better get her out of here, Rootenant, before they find us."

Lyla looked down at Alonzo. "Thank you, Alonzo, for watching over me and . . . and—" Her voice caught and she dropped to her knees and hugged the shaggy head tight against her.

Hunter watched ahead, Lyla beside him as they went through the dense trees. Alonzo walked soft-footed behind them, watching the rear. When they came to the first ghost trees and the dwindling of the tiger trees, Hunter thought it safe to walk slower and talk to her.

"I saw you go," he said. "I didn't know where until Alonzo came running to tell me."

"I heard him bragging about killing, and about his women—I was weak, wasn't I?"

"Weak?"

"I was afraid to face the future, just because it isn't to be exactly like I thought I wanted."

"What was the kind you wanted, Lyla?"

"Oh . . . I guess I wanted a husband who could see me only, and children, and evenings together in the flower garden, and . . . well, all the silly, sentimental little things that mean so much to a woman."

He thought, *Even with its heart half cut out, it still wanted to live . . . Coat for Janalee . . . the strip-tease queen . . .*

They passed through the last of the tiger trees and she said, "We're safe, now. The tigers never attack anyone outside their forest."

She was walking slowly and he said, "We should get on back before you're missed, shouldn't we?"

"Who would miss me?" she asked. "So long as I remain physically intact for the marriage night, who cares where or why I went away?"

There was the cold bleakness of winter in her eyes as she spoke, and

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in her voice the first undertone of brass. He saw that this was already the beginning of the change that Narf would make in her; the transformation of a girl young and wanting to love and be loved into a hard and cynical woman.

He put his arm around her shoulder, thinking that he should tell her that *he* cared and that she must never let Narf change her.

"Lyla, I—"

He realized how futile and foolish the words would sound. She would marry Narf, he would return to Earth, and they would never meet again. There were no words for him to speak on this last walk together, no way to tell her that he wanted to help her, to protect and care for her. No way to express the feeling inside him . . .

He did what seemed as natural under the circumstances as it had been for him to put his arm around her in the clearing. He tilted up her face and bent his head to kiss her.

And walked with jarring impact into the knobby elbow of a ghost tree limb.

The sun was down and dusk was darkening the camp when they arrived back at her cabin.

"Thank you, Dale," she said. Her hand squeezed his arm. "I didn't know I had a friend . . . but now we'll have to be strangers because—"

Gravel crunched loudly on one

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of the paths in the ghost trees and they looked back, to see Narf and Sonig coming, walking swiftly. Even at the distance, there was anger like a red aura about Narf.

"Well," Lyla said softly, "here comes my medicine."

Sonig stopped at his own cabin, to stand just within the doorway, watching. Narf strode on and stopped before Hunter and Lyla, his face twisted with savage hatred as he looked at Hunter. He spoke to Lyla with grating vehemence:

"You've done an excellent job of making an ass of yourself—and of me—haven't you? Come on in the cabin!"

Narf seized her by the arm, towering over her as he jerked her around toward the door. Hunter stepped quickly forward, feeling the hot flash of his own anger, but there was the paleness of Lyla's face as she looked back, an appeal on it that said, *No!* He stopped, realizing that Narf would not physically harm the woman who would make him king of Vesta, and that any interference on his part would only make everything the harder for her.

He watched the two go into the cabin—into Lyla's half—and Narf slammed the door shut behind them. There followed the quick bang of windows being closed, and then Narf's muffled tirade began: "*. . . May think I'm a fool . . . I'm going to tell you a few things . . .*"

Sonig was still standing within his doorway. Hunter knew, without seeing it, that the thin-lipped smile would be on Sonig's face.

He turned and walked back to his own cabin. There was nothing he could do but withdraw—and listen from a distance and be ready to act if it seemed she was in danger.

He sat on his doorstep in the darkness, hearing occasional phrases in Narf's unrelenting abuse. One was: "*So prim you had to countermand my order for a key to that lock—then you went out to play with that second lieutenant . . .*"

Alonzo materialized out of the darkness, coming as silently as a shadow. He was no longer the bumbling clown. The idiotic grin was gone and his eyes were green fire, slanted and catlike, his teeth flashing white in a snarl as he looked back toward the sound of Narf's voice.

"She are *my* Princess Ryra," Alonzo said. "He are cursing her. If he ever hurt her, I wirr tear out his throat and his river."

"He won't hurt her, Alonzo," Hunter said, wishing he could be sure. "He'll only use words on her."

"He never ask her *why* she run away—he onry curse her and threaten her because she embarrass him."

"Embarrass him?"

"He and Sonig, they see you coming out of the forest with your arm around her. They watch with high-power grasses."

"But there was nothing wrong in that—"

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"That are what Princess Ryra say. She say you onry put your arm around her because she are stirr scared of the tigers. And then he say, what about the other? And he cawr her awrful bad names."

"What other?"

"Oh, when you are bending down to kiss Princess Ryra and are wawrking into tree."

He gulped. "*They saw that?*"

"Oh, sure. Rord Narf are so mad he want to kirr you right then but Sonig say, 'Wait, I have a pran.' Then Sonig say, 'It are too bad we don't have a camera—we could have made that rootenant the raffing stock of forty worlds.' "

The thought made Hunter gulp again.

"What was Sonig's plan that Narf told Lyla about?" He asked.

"Oh, he not terr *her*. I hear Sonig terr Rord Narf when I spy. Sonig say, 'Tomorrow we be friendry and we ret those two go for another wawrk in the woods. And we have cameras with terescope lens and when they kiss and hug we take moving pictures."

"Why, the gutter-bred rat—"

"And Rord Narf say, 'That is what we wirr do. And then I wirr kirr him as soon as we have the pictures and she wirr have to toe the mark from then on because if I pubricry show the pictures of what she did, she wirr be ashamed to show her face anywhere on Vesta.' "

"Why, the—" He could not think of a suitable expression.

"And then Sonig say, 'To make sure she go out tomorrow, you bawr her out good so she wirr want to cry on the rootenant's shourder again. And Rord Narf say, 'I wirr be very grad to terr the two-timing hussy what I think of her, don't worry.' "

"Why, she was only a scared girl and that rat thinks she—"

". . . *Your promise to your dying father*" Narf's voice came in accusation." *He's gone, now, and you can betray him, too! Why don't you go all the way in your deceptions . . . your father will never know . . .*"

Alonzo said, "I think I go back and stay croser to her cabin, Rootenant."

It was an hour later, and Narf's voice had settled to a low, steady growling, when Hunter heard a helicopter settle down near the camp. A minute later, Val Boran was outlined momentarily in the doorway of the cabin he shared with Sonig. There followed the exchange of a few words—interrogation in Val's tone—and then the sound of Sonig's voice alone, which continued for minute after minute.

Sonig is telling him all about it, Hunter thought, *including my walking into that tree. But there won't be one word in sympathy with Lyla.*

Sonig's story ended and Hunter saw Val leave the cabin. He came straight up the path toward Hunter, looming tall in the darkness as he stopped before him.

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There was the pale gleam of metal in Val's belt—a blaster. His voice came cold and flat:

"I want to talk to you, Lieutenant."

Hunter sighed, thinking, *I suppose he wants to kill me, too.*

He got up and said, "We'll go inside. Shut the door behind you—I don't want your friend straining his ears to hear us."

Val sat tall even in the chair, his face like a carving in a dark granite and his eyes as bright and hard.

"I understand that you took Princess Lyla into the tiger forest today." Val's hand was very near the blaster. "I understand you then played the role of affectionate rescuer."

"Do you believe that story?" Hunter asked.

"Do you have a different one?"

"You might ask Lyla. Or Alonzo. Alonzo is the one who came to me for help when he saw she was going out to die."

"To die?" A startled expression came into the black eyes. "She *wanted* to die?"

"I'll tell you what happened," Hunter said, and told him the story, omitting only the embarrassing kissing incident and knowing that Sonig had not.

Val was silent for a while after Hunter finished speaking, then he said, "It isn't for me to comment upon Lord Narf's character or actions. She is his wife by her own choice. But the thought of someone else taking her out and—"

"I know. It wasn't so." Then Hunter added, "You think a great deal of her, don't you?"

Val's face hardened and Hunter thought he would not answer. Then he smiled a little, even though without humor, and said:

"Since I came here to kill you if I thought you deserved it, I suppose I am obligated to answer your question. My regard for Princess Lyla is the respectful one that any civilized man would have for another man's wife."

There was an unintended implication in the statement and Hunter made a conjecture:

"You and Princess Lyla were engaged—how long ago?"

There was surprise on Val's face, and something like pain quickly masked. "So she's already making it public information?

"No. I learned of it from . . . other sources. I don't know, of course, why you persuaded her to break the engagement—that's none of my business, anyway."

"No," Val said. "It's none of your business. I'll tell you this: *I* didn't ask her to break the engagement. But so long as that was what she wanted, I certainly wasn't going to beg her to change her mind."

Val stood up to go. "If you don't mind, I would rather you said nothing to Princess Lyla about this visit tonight. I'm afraid my misplaced surge of chivalry would make me look like a fool to her."

Then, as an afterthought, Val

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added, "Mr. Rockford had further business in the city."

It was late when Narf finally left Lyla's part of the cabin. He went to the cabin occupied by Val and Sonig, aroused Sonig, and the two of them went to the helicopter field. Hunter heard the helicopter leaving for the city a few minutes later. Val's cabin remained dark and after a while, the light in Lyla's cabin went out.

He went to bed, but not to sleep. Over and over, a lonely little Princess Lyla clung to him for comfort, crying, while he held her close. He twisted and turned restlessly as he thought of the hours she had sat alone and unloved while Narf poured out his hatred and fury on her.

There was a yearning for her, a desire to hold her and always protect her, that would not let him sleep. And he realized the reason why.

He thought miserably, *I'm in love with her!*

Rockford was in bed, snoring loudly, with six empty beer cans on the floor beside him, when Hunter got up. He went outside and found Alonzo waiting for him.

"They got it awr pranned to kirr you for sure today, Rootenant."

"How?" he asked.

"Rast night, Rord Narf and Sonig go to the city and Rord Narf, he hire four bad-rooking men with brasters, and Sonig hire four more that are his countrymen, and they bring these men back and now they are hiding in the woods. And they awrso bring back movie cameras with terescope renses. And Rord Narf raff and say he wirr marry Princess Ryra today before your dead body is even coor."

"Oh?" Hunter said. He thought of the snoring Rockford and his words of two days before: *If you manage to live that long.* How, he wondered, could the lazy old drunkard have made such an accurate guess?

"And then," Alonzo said, "Rord Narf wake up Princess Ryra—onry I know she wasn't asreep—and he terr her he ruv her and have awready made awr the arrangement for them to get married today, right after runch. And he terr her she is right about the Space Guard and she wirr have until runch to tawrk to you about it."

There was the sound of Narf's door opening and closing and Alonzo said, "I go now—Rord Narf might guess that I are terring you things."

A few minutes later Narf and Sonig came down the path toward Hunter. Both carried packsacks—the cameras, of course—and both carried long-range rifle blasters.

"Good morning, lieutenant!" Narf was smiling and pseudogenial again. "About last night—sometimes a man has to be stern with his wife to impress her. Very

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foolish thing she did—might have been killed. I'm afraid I was so badly shaken with worry over her that I didn't even thank you for bringing her back."

"A beautiful morning, lieutenant!" Sonig was smiling, coming as close to beaming as the nature of his face would permit. "Lord Narf is going to take me stag hunting this morning—I'll get some lessons from a master. Did you ever see his lordship's collection of heads? Amazing!"

"But it seems a sportsman's collection is never quite complete," Narf said. He was still smiling but the hatred was burning like a fire in his eyes as he looked at Hunter. "There's one more head I must have—I intend to get it this morning."

Narf and Sonig were gone when Lyla came out of her cabin, her face pale and drawn. Val came out of his cabin and the two spoke to each other in greeting. There was a silence, in which neither seemed to know what to say.

Finally, awkwardly, Val said, "I heard about yesterday, Lyla. Why did you go into the tiger forest?"

"Oh . . . I was just walking, I guess, and didn't notice where."

"You went there to die, didn't you?"

"I . . . when you have nothing left—" Then she lifted her head in a proud gesture and said, "Should it matter to you?"

For a moment Val had the look of a man struck. Then it was gone and he said in an emotionless voice:

"No. I was asking about something that is only your husband's business. I won't do it again."

He turned away, back to his cabin.

"Val—" She took a quick step after him, the proud air gone and her arms outstretched. "I didn't mean—"

He turned back, his tone politely questioning.

"Yes?"

"I only wanted—" Then her arms dropped and the life went out of her voice. "What does it matter . . . what does anything matter?"

She hurried into her cabin and the door closed behind her.

Rockford spoke from the doorway behind Hunter:

"Well, my boy, are you ready for your day's duties?"

He followed Rockford inside, where Rockford settled down in the easy-chair and yawned.

"I had a rather busy night," he said. "Certain events occurred yesterday afternoon which forced me to change my own plans to some extent. Or to set them ahead a day, I should say."

He made an effort to put the vision of Lyla from his mind and asked, "Did you make any progress with Val Boran?"

"No, I'm afraid not. Of course, I didn't expect to." Rockford yawned again. "There was another

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message from Supreme Command. The situation is getting worse. Which reminds me of your Duty For The Day and the fact that if you can live through it, you will have it made."

He's my superior, Hunter thought. *He's supposed to outrank a Space Patrol General—and he's amused by the situation he's here to remedy.*

"Right now," Rockford said, "Lyla faces a grim future and feels like she doesn't have a friend in the world. She needs a shoulder to cry on. You will take her for a walk and supply that shoulder."

Somehow, even though the order had nothing to do with the Terran-Verdam crisis, he did not have the heart to object. She had been crying before she even reached her door. Later, after he had comforted her, he would demand that Rockford get down to determined effort on the Verdam problem. No more than an hour would be lost by that . . .

"Yes, sir," he said. "But in the interests of Princess Lyla's safety, I had better talk to her in her cabin. Alonzo saw Narf and Sonig bring back eight—"

"Professional killers, to dispose of you," Rockford finished. "I know all about it, and I know that Narf took time last night to spend an hour with his favorite girl friend and brag even to her that he was going to marry Lyla today before your dead body had time to get cool.

"But you just take Lyla for another walk and you will cause the beginning of the end for the Verdam Peoples Worlds. You will go down in history, my boy, as the man who saved the Terran Republic."

Hunter went out the door, again feeling a feverish sense of unreality. He was to go forth and get blasted into hamburger and by some mysterious process known only to Rockford, the Verdam empire would contritely start collapsing.

He did not knock on her door. He did not think of it as a violation of her privacy. She would be feeling too alone and unwanted to care.

She was not crying as he had thought she would be. She was standing by the window, staring down at the gray, distant desert, her eyes as bleakly empty as it.

"Hello, Lyla," he said.

"Hello, Dale. I was just thinking; this is the day that I, as a woman, should always have dreamed about"—she tried to smile, and failed, and the brass came into her voice—"my wedding day!"

"Alonzo told me about it."

It seemed to him he should add something, such as to wish her happiness—but such words would be meaningless and farcical and they would both know it.

But there was no reason why he should endanger her by obeying Rockford's insane order. He would not do it—

"Ah . . . good morning, Lyla!" Rockford loomed in the doorway, jovial as a Santa Claus. "Did you know Dale wants to go for a walk

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in the woods with you this bright spring morning—and he's no doubt too bashful to tell you so? Do you good to get away from camp"—there was the suggestion of a pause—"while you're still free."

He turned a beaming smile on Hunter. "Don't stand there like a dummy, boy—take her by the arm and let her have a last walk with someone who cares what happens to her."

There was one thing about Rockford not compatible with his air of fond fatherliness: his eyes were hard, gray slate as they looked into Hunter's and there was no mistaking their expression. Rockford had not made a fatherly suggestion for his own amusement. He had given an order that he intended to be obeyed.

Hunter and Lyla walked on through the thickets of ghost trees and arrow brush, each with little to say, Hunter feeling more and more like a ridiculous fool. They had no destination, no purpose in their walk, other than to abide by Rockford's desire that a total of ten assassins get a chance to slaughter a certain expendable second lieutenant.

He did not put his arm around Lyla as they walked. If they killed him, it would have to be without their having the satisfaction of the pictures they wanted with which to blackmail her.

They came to a tiny clearing, where a cloud tree log made an inviting seat in the shade, and Lyla said:

"No matter how far we walk, I'll have to go back to face it. Let's stop here, and rest a while."

He saw that the clearing was fairly well screened, but certainly not completely so. It would have to do.

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He sat down on the log several feet away from her, not wanting to take the chance of her getting hit by accident.

Not that I'm enthusiastic about getting hit by intent, myself, he thought. *What a way for a Space Guard officer to die.*

He wondered if Rockford would ever inform Headquarters that Lieutenant Dale Hunter had died in the line of duty—by whatever twisted logic this insane episode could be called duty—and he wondered how the Commemoration Roll would read for him . . . *Displaying courage above and beyond the call of duty, Lieutenant Hunter sat conspicuously on top of a hill and calmly waited for ten assassins to slaughter him . . .*

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"It's peaceful and quiet here, isn't it?" Lyla said.

He had been trying to watch four different directions at once and he realized that the constant swiveling of his neck was causing his stiff blouse collar to slowly cut his throat. And he saw that it was —for the moment, anyway—peaceful and quiet where they sat. The sun was warm and golden before them, bright flowers sweetly scented the air, and giant rainbow moths were fluttering over them, their tiny voices like the piping of a thousand fairy flutes.

"I wish I had been born a country girl," Lyla said. "I'd like to have a life like this, and not—what mine will be."

He asked the question to which he had to have the answer:

"Once you were going to marry Val and live on Darjeen, weren't you?"

"I . . . so my foolishness is no longer a secret?"

"Foolishness?" he asked.

"We met two years ago when I was attending the Fine Arts university on Jardeen. I was younger and a lot more naïve then than I am now. I thought we were desperately in love and would get married as soon as I finished school and would live happily ever after, and all that."

"And it didn't turn out that way?"

"I had to make that promise to Daddy and when I wrote to Val about it, he seemed to approve. He didn't suggest I renounce the proxy marriage when the time was up, or anything. He just wrote that I knew what I wanted to do. He seemed relieved to be free to go ahead with his political career."

"I see," he said, and then, "you don't feel bad about it, do you, Lyla?"

"Feel bad? I wouldn't marry Val Boran if he was the last man on Vesta! Even Lord Narf isn't as self-centered as *he* is!"

"You don't have to marry Narf, either," he said. "You know that."

She looked down at the ground and said in a dead voice, "I made a promise."

"Rockford told me that your father never really knew Narf—that on the few times they met, Narf put on the act of being a refined gentleman, very respectful toward the king's daughter."

She did not answer and he said, "Is that the way it was?"

"Yes. That's the way it was. But how could I tell Daddy, as he lay dying?"

"You couldn't, Lyla. But if your father could be here today and know what you know about Narf, do you think he would want you to marry him?"

"No . . . I guess not. But Lord Narf loves me in his own way, I think—and that's more than anyone else does."

Then her tone changed and she said, "I'm so glad that you're here today, Dale—I'm glad that there is someone who (*Continued on page 167*)

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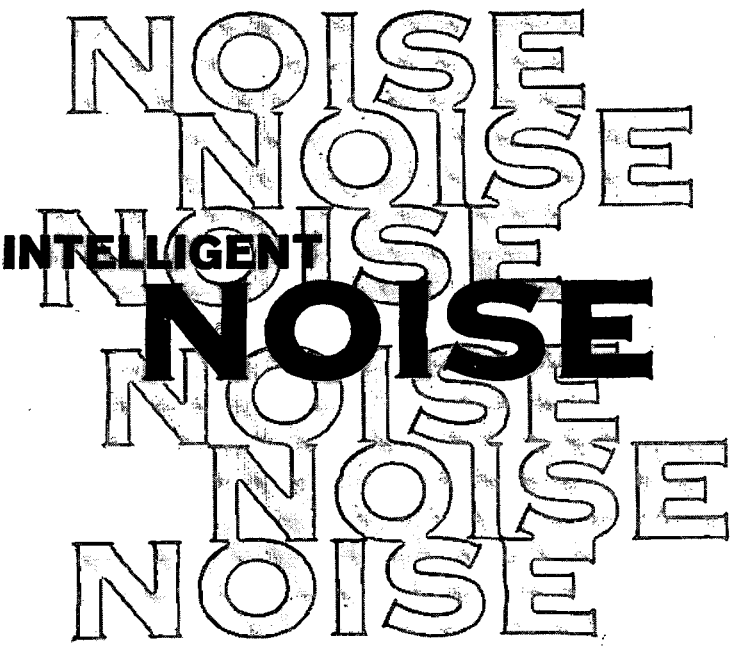

No matter what the technical definition of "noise" may be, the practical fact is that any messages that you can not interpret is noise to you. But when it looks like noise, sounds like noise, acts like noise, and can't be recognized as a message ...that's the latest technique in telecommunications!

by Alfred Pfanstiehl

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■ *Secondary examined the plastic sheets once more, his sharply filed fingerhorn tracing the symbols and wavy lines. The folds of deep red flesh around his ears quivered in his equivalent of a broad grin. This ought to make Primary most happy! He swiveled his acceleration couch to face Primary and waited for recognition.*

The captain looked up from his viewing screen and clicked a finger. "Did you run the analysis three times?" he asked.

"Affirmative, Primary. I ran all possible modulation auto-correlations more than three times because it seemed so strange. It's definite that only the lowest propagatable frequencies contain intelligence—and only voice type undulating signals at that, except for a few unmodulated carriers. Nothing at all in the higher bands. I can't understand it."

"You don't have to understand," Primary huffed. "We have seen cultural anomalies before. The computer could find no pulsed or phase-coherent tracking beams at all?"

Secondary let himself quiver a happy smile. "Absolutely none. They don't have the faintest idea we are up here. I let the receivers integrate much longer than necessary, and even checked the visible light bands and on up to the limit of our sensors. Just noise."

This was going to be pleasant and easy. Primary relaxed in his couch. He fished out a fresh packet of eyeglitter, horned it open and directly under his eyelids in one smooth motion. Yes, he could take his time on this one, and make sure he found the planet's most vulnerable spots. He savored the sparkling colors a moment before getting to work on the job at hand.

At Western UN Tracking Center, Mike Witkowski reached for the blinking phone. "West Center here . . . Chuck Park? Hi . . . How are things at East? . . . Really? Nineteen minutes. Give me the gross ephemerides off standard . . . Yeah . . . You are sure it isn't friendly? O.K., we'll get on it as it comes around. Sure . . . You alerted Safety? . . . All right, I'll call you back."

Fifty-one minutes later, just as Primary was happily arming the smaller torps—no need to waste the big ones—a couple of lovers on a hilltop wished on a rather odd-colored shooting star that terminated in a beautiful puff.

This article is about a very real breakthrough in conservation. The commodity to be conserved is the electromagnetic spectrum. We'll take a look at the fundamental workings of a system using radio waves in an entirely new manner so that an ordinary radio receiver simply can't hear the radar beams, control signals, teletypes, voices or other communications us-

Fig. 1. The Big Bird—here a Thor-Delta—takes off! But every such bird has to carry a built-in destruct circuit to destroy it if something goes wrong and it heads for a city instead of an orbit.

(Official U.S. Air Force Photo)

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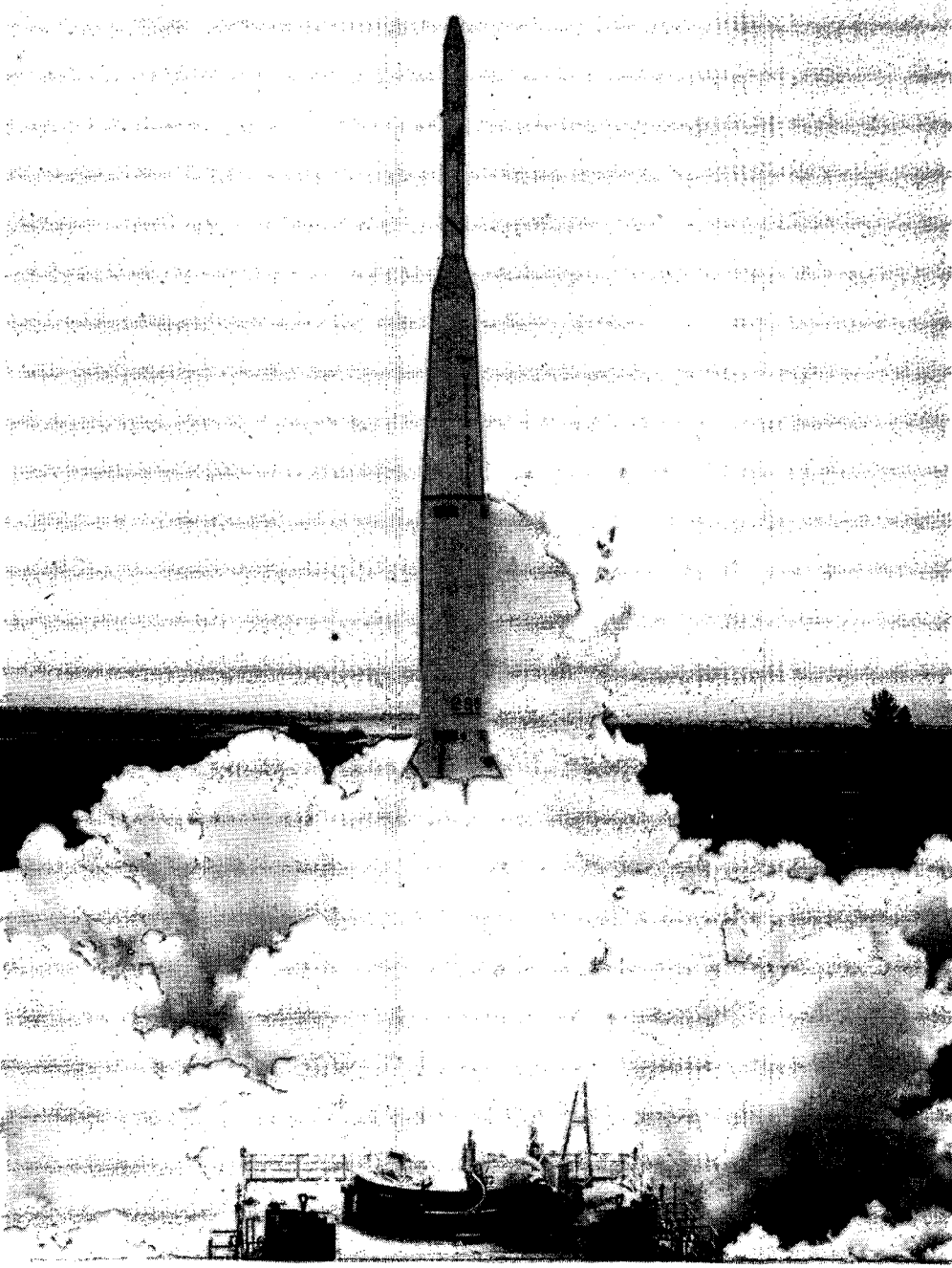

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ing the system. In fact, the more sensitive and selective the receiver, the less it picks up!

That alien ship had superb equipment for analyzing every type of radio signal on the air, or so they thought. Their receivers tuned up and down the radio spectrum and sharply filtered out every signal. They did a fine job of combing out all electromagnetic frequencies, sorting them into their respective cycle-per-second slots, suppressing much of the noise and static, and presenting the operator with a record of just what every transmitter was putting out within hundreds of miles. They couldn't possibly miss any radar beams powerful enough to seek out their ship.

But they did. Their equipment was so good at suppressing uncoherent, unintelligent noise that it *had* to miss. What we were broadcasting was intelligent noise—but apparently wholly random, useless noise, just the same. And even if they knew all about the equipment we were using, it would remain *extremely* difficult and unlikely that they could make head or tail of our transmissions, or even to jam them. (You never say *impossible* in this game; the technique we are going to describe is a true-blue breakthrough, but that doesn't preclude more breaks coming along later.)

With conservation of the electromagnetic spectrum the way is clear for even more delightful pictures of acid dripping in stomachs, sounds of gunshots, music, et cetera, plus radar search beams, control signals to missiles and airliners and taxis and garage doors et cetera, et cetera.

We have long known of the upcoming scarcity of available radio frequencies. There are lots of them, yes, but it happens that some bands are much more convenient to use than others. It's in the way they bounce around and the kind of equipment required to generate and receive them. Our natural resources such as air, water, fossil fuels, farming land and the electromagnetic spectrum can be conserved by not using them, but that's stagnation. Rationing or letting the price rise are ugly ideas. So we step up the hunt for new resources and re-use techniques, try substitutes, ask people *please* to stop waste and pollution, and once in a while discover significant ways to use what Nature has given us more efficiently.

At least until we learn how to turn psi phenomena on and off as a practical matter, it looks as if we are stuck with the good old electromagnetic spectrum for speedy communications. This covers every radiation, from a few cycles per second frequency on up through the familiar radio waves of

Fig. 2. Small button—for big results. A special coded signal must be able to destroy a wild launch vehicle.
(Wide World Photos)

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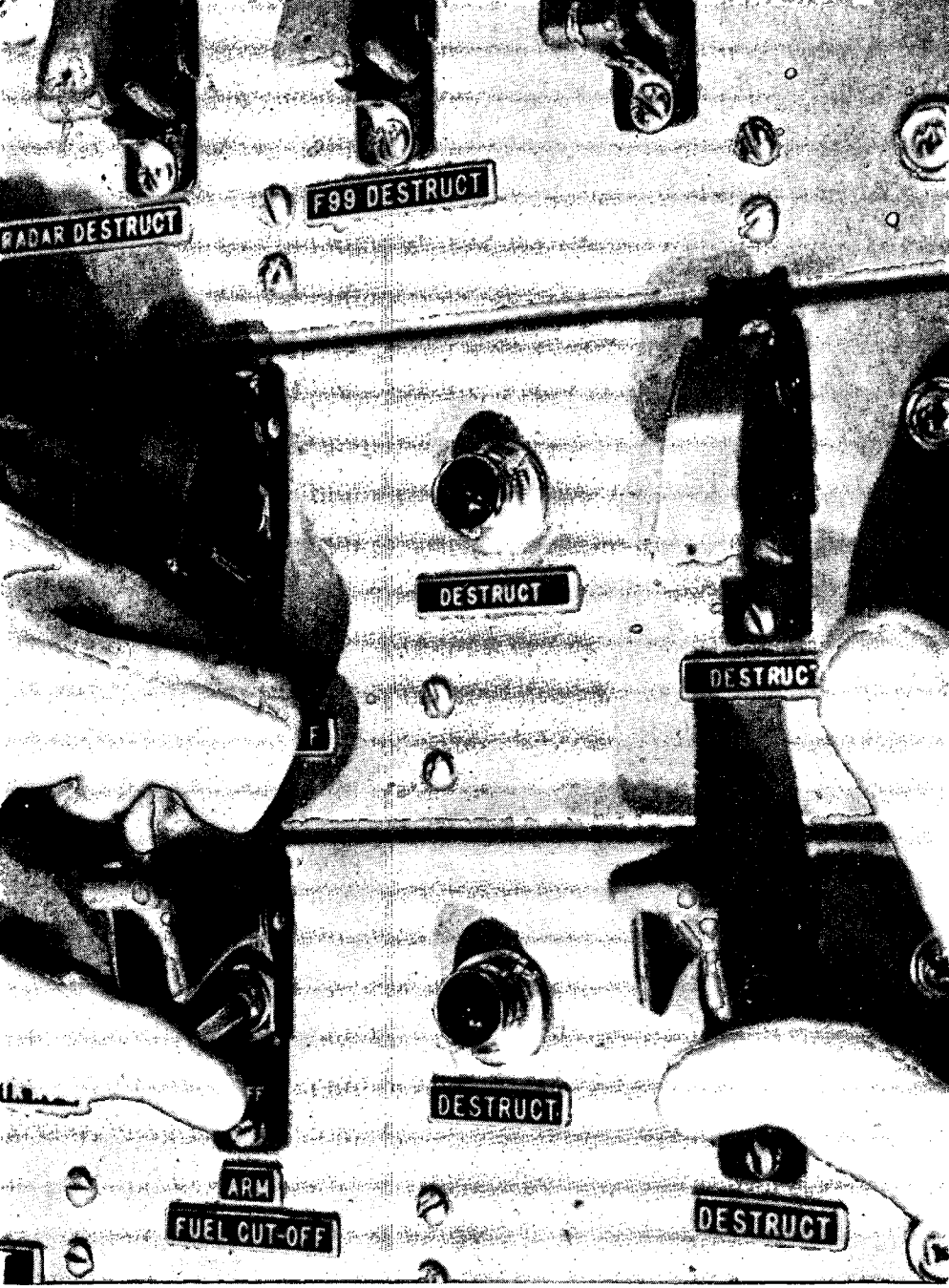

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kilo-, mega-, and kilomegacycles per second, infrared, daylight, ultraviolet, and clear up through the gamma, X, and cosmic rays. The convenient ways to measure and work with this type of radiation usually is to deal with frequencies—cycles per second—or wavelengths—centimeters per wave. The waves we talk about are some sort of changing "distortions of space" with the energy being handed back and forth between the stresses we identify as magnetic and electrostatic. Our whole mathematical basis for describing these waves and the energy they transmit uses the ideal and beautifully perfect "sine wave" as the model for how these signal energies change in time.

If your school-days trigonometry left you a little cold, so that a sine function only means "opposite side over the hypotenuse of a right triangle" and nothing more, you're missing one of Nature's glories. Actions that approach sine wave ideal motion, at least as far as we can measure, lie at the base of *so* many scientific observations and analyses. It is easy to become so impressed—or accustomed—to the mathematical power of the sine wave function that you tend to force all your thinking about motions—especially electrical motions in the field of electronics—into its undulating matrix. Sometimes this leads to defining frequencies in negative time, or in talking about zero-length portions of sine waves, but by golly, it all fits together so beautifully!

The sine wave derives from the circle: It is a plot of the distance from a point on the circumference to the horizontal diameter as the point moves steadily around the circle. It doesn't bother us that no such thing as a perfect circle—or perfect sine wave—exists except as an idea. We do need such ideal, perfect concepts as foundations for our imperfect, practical measurements and designs. The sine wave concept works magnificently when we deal with the ac inductance of coils, the capacitance of condensers, the radiation on antennas and such practical devices. These are the elements we combine, with other items, to make frequency-selective filters, impedance-matching transformers and all the other gadgets a circuit designer has available to make radio transmitters and receivers.

Perhaps too magnificently. The model we are accustomed to analyzes any non-sine wave signal

Fig. 3. Sometimes—as in the Johnston Island tests, and the first of the recent Mariner Venus-probe shots—the destruct button is pushed. But the problem is to keep an accidental signal—a misoperating diathermy machine, a static burst from lightning—from triggering the destruct circuit. The lock-and key characteristics of PRNC multi-frequency-channel systems provide jamproof signaling.

(Wide World Photos)

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—it can be square, triangular, short pulses, a conglomeration such as music or speech, or even the outline of the skyline of New York—into combinations of smooth sine waves with various frequencies, amplitudes and starting points—phase—in time. This model checks out so well that perhaps it has trapped us.

We build filters and "wave analyzers" which break down any non-sinusoidal complex wave into a series of sine wave components. And we can turn around and synthesize almost any complex wave from a set of pure sine wave elements. So it looks as if we have come to confuse this model, which works so well with the types of circuits we have designed *by using the model*, that we forget that it is only a model. Marks on paper are not the real thing.

There happens to be other, although not so convenient, ways of analyzing complex waves. And you seldom get breakthroughs by sticking to conventional thinking and methods. (The history of this breakthrough is *not* that of a wild tangent from conventional thinking, by the way; that seldom works, either. It's just a little switch in emphasis, with good doses of imagination and serendipity.)

It's conventional to think of the whole electromagnetic spectrum as a continuous stream of frequencies, starting with the slowly changing, long wavelengths, and going on up to the faster frequency, shorter wavelengths. We commonly restrict our thinking to the "frequency domain" approach, identifying each frequency as a point on the line covering all frequencies. And now we find that this stream of frequencies is getting mighty crowded. We ration out specific frequency bands for each transmitter we allow to broadcast radio wave energy. The best swimming holes in this stream are filled, and much of it is uncomfortably polluted by natural and man-made trash—static, ignition noise, et cetera.

Thirty or forty years ago the few naked boys splashing around near the low end of this stream didn't bother anyone; it was all pretty much just for fun, anyway. But today you should hear some of these same lads—no longer in suntanned freedom—cuss when a missile count-down is delayed while some doctor's diathermy machine is located and turned off. It was only slightly, but very expensively, out of whack.

Beware of analogies! This one identifies the whole set of available radio frequencies as a continuous line—stream—in which we reserve spaces for specific signals—swimmers. It is the customary view. But until recently it has been holding back a truly efficient use of the radio spectrum.

We've been trying to teach the swimmers not to splash too much and to keep their arms down in

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order to make room for others. We assign narrow channels for each body, and only let those in who are carrying legitimate messages or on some specific duty. This is wise and necessary when the message-carrying swimmers are conventional transmitters and receivers that must be turned to specific, narrow bands of frequencies.

But now we have Pseudo Random Noise Generators—pronounced PRNG. With them, an apparently wide band of radio frequencies can carry many more messages simultaneously than when each message is assigned a narrow, side-by-side frequency channel. The technique stops interference and "cross-talk" between the messages.

There are other approaches to conservation of our radio frequency spectrum besides using PRNG techniques. An obvious one is to use thin, non-spreading, aimed beams from the transmitter to the receiver whenever *broad*casting isn't required and when point-to-point clear views are available—or "scatter propagation" is employed. Thus lots of sets can operate on the same assigned frequency channel, as long as only wanted pairs can "see" each other. Such microwave links are common and effective, but their application is rather limited.

Another approach, and a very elegant one, is to wring the dead time out of conversation. Sometimes when you telephone overseas, every slight pause in your string of words and syllables is detected and filled with someone else's utterance. This is based on probability theory, and it is quite a scramble. But it works, letting one radio link carry several times as many talkers as before. It's limited to voice type communications, of course.

And still another approach is to develop components able to transmit and receive at higher and higher radio frequencies. The higher you go, the more room is available to pack in communication channels, but the broadcasting and propagation problems get tougher. "Coherent light" using the LASER is the latest in *really* high frequency utilization. X rays might be next, for all we know.

But this is the story of PRNG.

Without using any mysterious new components, PRNG systems seem to do funny things with the electromagnetic spectrum. The same old tubes or transistors, coils, condensers, resistors and such are all you need—except that some of them have to be good quality, fast acting elements. All we do is put them together without being too bound by "frequency domain" thinking. We pay more attention to the "time domain" concept, and we remember that *frequencies* of pure sine waves are merely one convenient, if limiting, way of looking at what goes on. We find a much better way of working with radio signals by remembering that a specific frequency, during any short slice of time, is really best tagged as a

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time rate of change of phase. (More on this later.)

The electromagnetic spectrum: Well, Newton's prism—and drops of mist—show us a rainbow spread of a small part of it. A radio dial or TV channel selector tunes over another part, picking out fairly narrow bands of frequencies from all the others around. We draw a nice two-dimensional picture of any specific portion of the spectrum, the array of frequencies along the horizontal scale and vertical lines at certain frequency points to represent the signal level or amount of energy present at that frequency. The panoramic spectrum analyzer is a useful device that sweeps up and down the radio frequencies—within fairly narrow limits—and shows a beautiful graph on an oscilloscope screen of all the signals being picked up. Each one appears as a nice vertical line as long as it is present.

This is handy for people looking for possible interference signals prior to a missile shoot, so they can select a clear channel for their guidance and telemetry signals. It is used for monitoring illegal broadcasting or enemy operations. Radio and radar engineers use spectrum analyzers for "seeing" the modulation sidebands of their transmitters. These sidebands pop up at definite points on each side of the main center frequency, and appear to be the information-carrying elements. It's normally important to avoid "over modulation" which spreads these sidebands over too much of the spectrum.

So what's wrong with this? Frequencies *are* unique; either you have one or you don't. Radio waves carry energy at certain frequencies, don't they?

Yes, but how about this word *frequency* . . . so we count the number of cycles per unit time, and that's it, eh? Cycles of what? Well, of the repeating pattern of distortions of space, or whatever an electromagnetic wave is, as it zips by a radio's antenna at about the speed of light. This generates an electrical voltage in the sine wave pattern—rise, peak, fall, reverse, dip, return—for each cycle. That voltage can push a current, and current can do work. That's energy. If you are not too far away from the broadcasting station it's enough energy to be detected and encourage appropriate wiggles of the iron diaphragm of an earphone without being amplified, in the case of a crystal set.

But when we take a close look at that cycle of radio-frequency voltage or current, we find moments of zero energy as the sine wave crosses its zero line to reverse the direction of push. (Truly zero energy for zero time, to be sure, but certainly *very* small energy for *some* time.) Perhaps we ought to wonder what those vertical lines in a typical frequency spectrum represent. Apparently they show only a constant peak energy or some sort of average over a dynamic cycle.

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The concept of instantaneous frequency is purely mathematical but we don't have to define frequency as the time rate of change of phase, which it is, to see the fundamental notion here. Perhaps we ought to suspect those lines in the frequency spectrum that represent *energy*—or signal amplitude—at a certain *frequency*. Better think of changing energy, rising and falling—really transforming from one mode of energy to another—as time passes. Now we can narrow our view to smaller and smaller slices of time, and not worry about whole cycles as units.

This puts us in the time domain. It is just as "real" a way to look at the oscillations of radio waves as the conventional frequency domain view. But it happens to be worse than inconvenient—it's downright hopeless—to design conventional tuned circuits and filters for radio transmitters, receivers, hi-fi sets or servo systems *unless* you stick with frequency domain thinking. There is no other way to calculate and measure frequency responses, band widths, phase shifts, et cetera, that electronic engineers learn are all-important.

So the idea of two-dimensional frequency spectra has been accepted without question. Of course, it doesn't particularly bother anyone that such a graph can only show a steady, constant condition. When "amplitude modulation sidebands" are shown, for instance, it's for the rather limited case of modulation by an unchanging signal. We make a quick snapshot of a steady tone or series of pulses, but not quick enough to slice into the individual cycles. Start talking into the microphone, and the sidebands have to dart around, pop on and off, and generally stir up quite a fuss to follow your speech. One of the little difficulties with frequency domain thinking, handy as it is, comes from the fact that signal frequencies don't stay constant; in fact they *can't*, if the intent is to communicate something.

If we really want to visualize *when* we have *how much* energy at *what* frequency, we have to draw, or rather construct, three-dimensional graphs. These are fun, and give you lovely jagged mountains or ski slopes.

These 3-D graphs still can't show us the whole picture, although they are much better than semi-long exposure snapshot views in two dimensions—conventional frequency spectra. But they still have a *frequency* axis. Perhaps we need 4-D graphs to include the up and down oscillations of each frequency itself. A roomful of 3-D graphs would do, in case you have trouble building four-dimensional objects. These would be stacked in rows, showing a time sequence of what goes on, with very small increments of time between each graph. Rather awkward, this combining of two amplitude and two time axes—but that's

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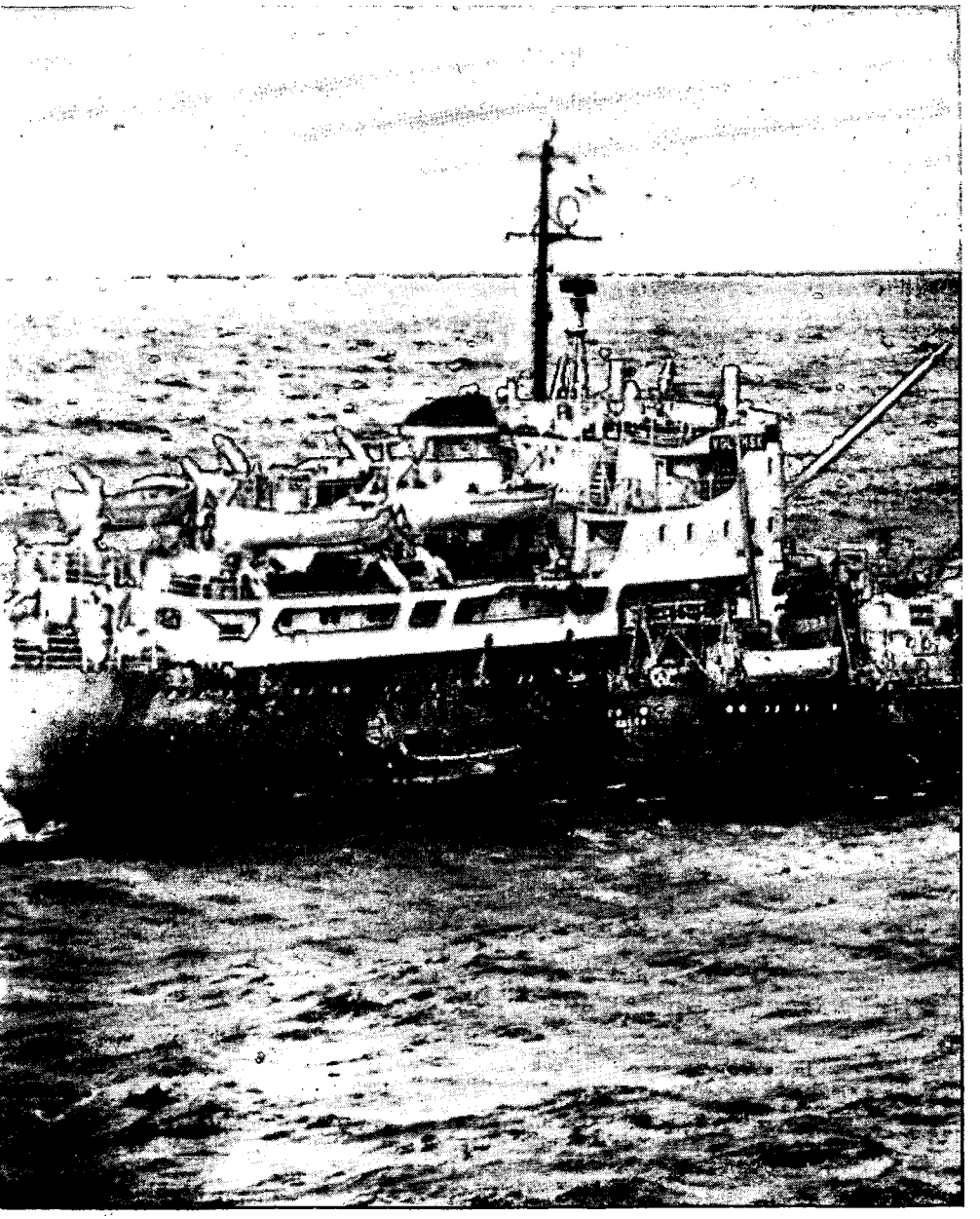

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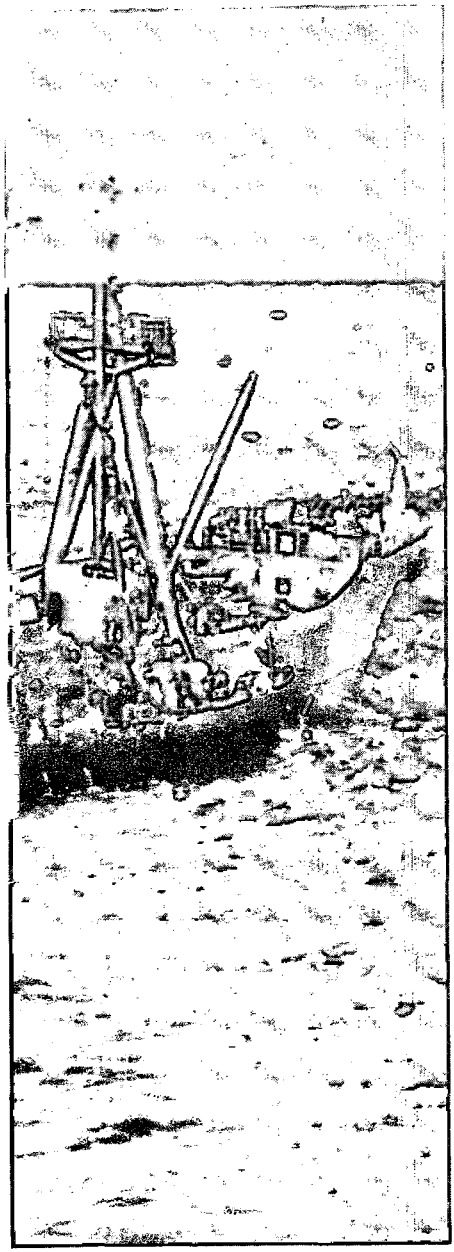

what pure time domain thinking would require.

Actually, this discussion of pure and complete time domain thinking is a bit of a digression. We can go ahead with the basic idea of PRNG systems without getting that involved. It's just that we must look carefully at what a *frequency* is. The highly useful but conventional mathematical model sometimes assumes too much—for breakthroughs—such as only the existence of pure sine waves which oscillate forever.

The time domain view shows us the rise and fall of each cycle of a radio wave. Now we might think it is a shame we can't "do something" about those slices of time when the signal energy approaches the zero line and reverses. What a waste of perfectly good time while there is practically zero energy going out!

Not really. We *need* periods of "nothing" in order to contrast with periods of "something" and

Fig. 4. A Russian trawler mother ship some 80 miles off Cape Cod. It is certain that the Russians are fishing . . . but some of the trawlers are fishing in the radio spectrum, rather than the sea. It's a little difficult, however, to catch such frequency-agile fish as PRNC transmission permits! And there are times when we'd prefer to have telemetry and radar data strictly private, even though broadcast.
(Wide World Photos)

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thus communicate, whether by voice, morse code or a modulated radio frequency signal. But we don't have to alternate through periods of "nothing"; we might as well have periods of "something else" as long as they differ from the "something" that marks our desired signal—and we can separate the two. This is one way of touching on what a PRNG system does: the "something else" can be the energy of other channels of communication if we can keep it out of the channel we want to listen to. We can, by changing our ideas of how to tune in a signal. Now it is possible for many channels to appear to use the same set of frequencies in the spectrum; the tuning is in the time domain rather than the frequency domain. It is more efficient because little slices of time that formerly were reserved and wasted now can be used.

If all this is about a process of communication, we had better clarify just what communication is. Simple: It's information transfer. Then what is information? Scientists don't appreciate hazy notions and "tendencies" or just fancy names for things. They try to tie things down to isolated quantities they can measure, duplicate, predict. So the atom of information is called one "bit." Let's be satisfied that a bit is some sort of irreducible minimum yes-no datum. We use on-off, this-that, arranged in codes to transfer information. (Human voice is an astonishingly poor code—redundant and very wasteful of time, at least for straightforward, non-subtle communications, but brains are good at interpreting this code through a lot of noise and code variations.)

Time is the important factor; we want to use as little time as possible to transfer the most possible information. So we deal in information *rate*, in bits per second. Any wasted, unused time, even in the smallest of slices, is one influence limiting information rate; the other is the signal-to-noise ratio.

In the rather complex study of *information theory* we end up relating information rate with channel bandwidth. We find theoretical and practical minimum limits on the size of the hole in the frequency spectrum we think has to be reserved to establish radio communication, for example, at any particular bits per second, signal energy and disturbing noise energy levels. Some of the theoretical limits still hold, but PRNG systems do great things to those practical limits.

The really important factor in practical cases is noise. Nature and man's doings are noisy. Non-information signals are scattered all over the electromagnetic spectrum, using the same agency of propagation that we find convenient to use for communication.

Information rate, remember, requires channel bandwidth even if there is no noise. If you transmit

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one and only one frequency, steadily, not letting it change in amplitude or frequency—no shifting of phase—then you really aren't sending much information. It would be O.K. as a radio homing beacon for aircraft, or if all you wanted to know was whether something was on or off. Such a signal, using zero bandwidth, would merely take forever to establish one bit.

We have to use other frequencies, simultaneously or in sequence, to establish bits of information quickly. We have to spread out along the spectrum so many cycles per second to send a certain number of bits per second. Sadly, this means the receiver's bandwidth to accommodate the desired signal—and reject others—can't help but let in some noise, too. The ever-present noise from space, sparkplugs and even the components of the receiver itself can't be wished away. A receiver can have as many tubes or transistors or paramps or framistamps as you want, amplifying whatever hits the antenna by any amount, but all the good *that* does if the included noise is much greater than the wanted signal.

Pseudo Random Noise Modulation—we should be calling it this, but PRNG is easier to pronounce—is only one of a number of systems using *correlation*, which is the magic word these days. They all go a long way toward beating the noise problem, but PRNG goes them one better with its multiple-channels-in-the-same-bandwidth. Before we describe the system itself, we have two more concepts to discuss. These are *a priori* information and *filter memory*.

You have *a priori* information if you know something of what you expect to hear, in advance. Not everything; no need to communicate, in that case, but something—such as the basic frequency, the particular code or language, or the type of modulation being used. PRNG transmissions depend on having a lot more *a priori* knowledge than ordinary methods require. It buys efficiency.

Among its other duties, a radio receiver acts as a filter, selecting out the particular band of frequencies to which it is tuned. But it isn't quite right to think of this filtering action as if it were like using a sieve. Frequency is a per-second commodity, involving the idea of time. You can't tell if you *have* a frequency, not to say measure its cycles per second, unless you watch it for some period of time. One cycle, or even a fraction of a cycle will do. An ordinary tuned filter does this; it remembers how the input signal was changing a short while ago by sort of matching this with its own resonant frequency. Hit it with the right frequency for a while and heavy currents start circulating back and forth, around the circuit. For a while . . . and that's the rub.

A narrow bandwidth filter—we

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say one with a high "Q"—that we would like to use for fine selectivity and noise reduction takes quite a time to get it rocking, to start its filtering action. Usually many, many cycles of the resonant frequency—in the order of one third of the Q, and Q can be in the thousands. Not only that, but it is hard to stop it quickly when the input signal is removed. It has electrical inertia. Well, this can limit the information rate we can expect in any particular bandwidth. Yet if we use wider bandwidth—filters with lower Q—we open up the gates for more noise, too. In conventional systems we simply have to live with wide bandwidth for any fast-changing, high information rate signal, and lick the noise problem with sheer signal power. It's always a compromise. Brute force isn't very sophisticated, however.

This noise problem is the main reason why ordinary radars with any sort of respectable range must transmit such tremendous peak powers in their pulses. One can get well cooked if foolish enough to stand close to the antenna. Now in the works: radars with equivalent range capabilities that you can hardly tell are on the air if you use a standard type receiver tuned as carefully as you like to the correct center frequency. Such a receiver would buzz like a banshee if tuned to a regular radar.

PRNG systems do their magic, as I said, without resorting to mysterious new components. They merely employ a new type of modulation and a new concept of tuning for one signal among many. You are familiar with the old standby modulations, AM and FM. Amplitude or frequency—sometimes both—of a radio frequency carrier wave are controlled by the intelligence frequencies, meaning the voice, music, television impulses, teletype codes or whatever. There are various adaptations of AM and FM, such as PCM (pulse code modulation), PDM (pulse duration modulation), PAM (pulse amplitude modulation) and others. Pseudo Random Noise Modulation is actually a sort of PCM, but with finer use of *a priori* information.

And don't forget that business about *filter memory*. All those pulse types of modulation run into this narrow-band, response-limiting roadblock—except PRNG systems.

Now we'll take a look at the lash-up in a PRNG transmitter and receiver to see how the system provides more efficient use of the electro-magnetic spectrum. It turns out that this business of time-scatter tuning—instead of frequency-band tuning—is easier to understand in principle than a color television set, and not much more complicated in actual practice.

The heart of the system, the PRN Generator itself, is a bit difficult to describe, but that's a minor detail. We'll talk like Systems

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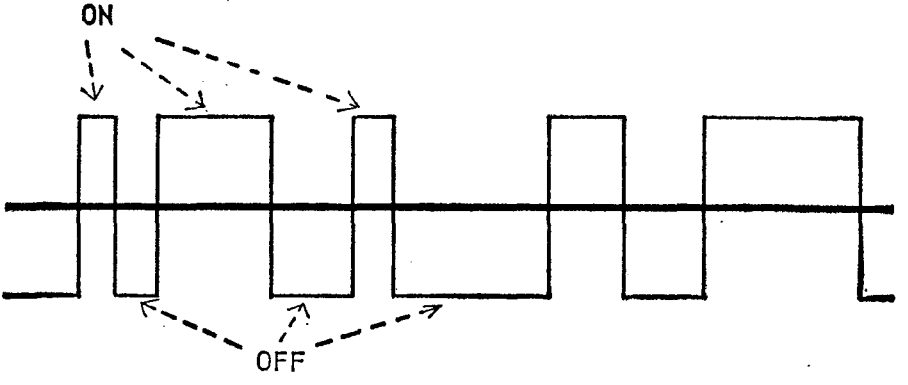
Engineers and worry only about what goes in and out of black boxes. (You didn't really want a course in flip-flops, shift registers, digital feedback and all that, did you? We're after *fundamentals*.)

So we have a black box called a PRNG. We feed a steady series of electrical pulses into it. These are generated by a "clock" oscillator that ticks at something like ten million pulses per second. It can be controlled—modulated—to go a little faster or slower as required. We get out of the PRNG a rather special kind of pulse code. This code repeats itself continually. It is made of a variety of short, medium and long pulses scattered in a calculated but apparently random sequence. It is easy to build two PRNG's that will deliver exactly the same code sequences if fed by clocks going at similar rates.

A portion of one of these on-off Pseudo Random Codes might look like this:

The important feature is that on a relatively long-term average, the pulses are "on" for just as much time as they are "off." The total average energy is just half of the peak; the line through the center places equal areas of "on" time above and below the line. (The same could be said for the "off" times.) We say the code's *duty cycle* over many pulses is fifty per cent. A lower duty cycle would mean that the pulses would "weigh" less than the spaces. Anything but a fifty per cent duty cycle would defeat our purpose.

Now we take the business end of a normal radio transmitter, where the radio frequencies are generated and power-amplified for delivering to the transmitting antenna. Ordinarily, the voice, music, TV pulses, control signals or whatever intelligence we want to broadcast are used to modulate—to control—the radio frequencies directly—using AM or FM.



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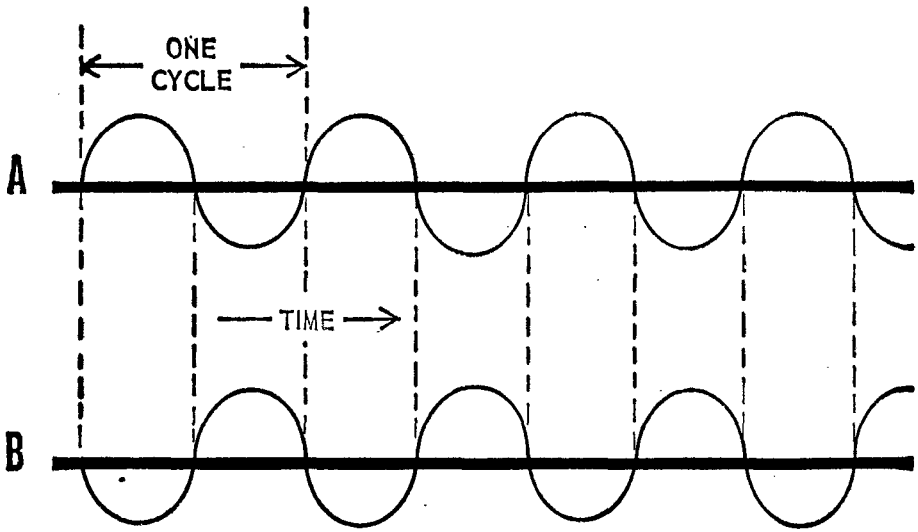
But in the case we're talking about, we take the steady radio frequencies and split them into two lines with 180° phase difference. The two radio signals thus produced look like mirror images of each other:



180° PHASE DIFFERENCE

These radio frequencies are usually up in the hundreds of megacycles per second, so the few cycles shown in the drawing only represent a small fraction of a millionth of a second.

The next step is to build a very fast operating switch to select one or the other of those 180° apart radio-frequency lines as the one to be broadcast. This switch is purely electronic; no mechanical toggle switch or commutator could possibly go fast enough. The control signal for the switch is the pseudo random code. So now what we actually transmit is either one phase or the other of the radio frequency, flipping back and forth as the code sequence dictates.

If a regular receiver tries to tune in on this fast, odd, apparently random phase flipping signal, nothing happens! The normal receiver, remember, is primarily a narrow band filter; it has a high "Q"; it takes *time* for it to recognize any particular frequency or sudden shift in frequency. The 180° flipping signal amounts to sudden shifting

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of one-half cycles in frequency, and these flips simply occur too fast. Before the receiver can detect one of the pulses, the signal turns upsidedown. The sad result in the tuned circuits is that nearly all of the input energy is canceled out. The filter memory does it. You *could* make a wide-band receiver fast enough to pick up the code, but it couldn't help picking up a lot more noise, too. Then how *do* we tune in on this mess without hearing that noise, pseudo or truly random?

With *a priori* knowledge. We put a duplicate PRNG in our receiver, take its exactly matching code—modulating a coherent local oscillator, if you want the whole story—and mix it with the signal coming in from the receiving antenna. If we do this correctly—minor details—each 180° phase turn-over flip of the received signal is matched by a flip of the locally generated signal. The two codes track right along together, and we get a nice, continuous, non-flipping signal out. We arrange for the codes to aid each other rather than cancel, of course. The local generator in our receiver "knows" just when to reverse its phase to *match* the incoming signal, so this arrangement is sometimes called a "matched filter." In particular, a matched filter does *not* have electrical inertia. Now, most happily, the steady output of the combining-aiding mixing process *can* be filtered in a very narrow band circuit. We don't care about filter memory because this signal isn't changing. The narrow bandwidth cuts out tremendous amounts of interfering noise, giving us a much more respectable signal-to-noise ratio.

This doesn't tell us how we talk or communicate anything over such a transmission link. All we seem to have at this point is a steady, clean signal. Well, remember the clock oscillator that feeds a fast line of pulses to the pseudo random noise generator black box? The PRNG at the receiver includes a duplicate clock, of course, but it is a bit of a trick to make sure this clock *does* duplicate the one at the transmitter. Not just in frequency, but in pulse-by-pulse correlation. We say the two clocks must be "phase coherent" which means they must match up very closely. I can't say match up *perfectly* because nothing in practical science is perfect. (Scientists and engineers spend a lot of time trying to define how perfect any measurement can be in the inevitable presence of noise to disturb things.) If we want to make one action match another, we must have feedback. So we detect when the match is getting a little off, then correct the situation manually or automatically. In the feedback loop that keeps the receiver's PRNG right on the button, we have an error signal to control the clock oscillator—to speed it up or slow it down a little as required. This can just as well be a pretty fast correcting action,

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maybe at a rate of several million corrections per second.

All right, the receiver's clock follows the transmitter's clock. What if we purposely make little changes in the transmitter's clock? Why, the receiver's clock follows right along, dutifully maintaining close correlation. So all we do is modulate the clock frequency with whatever intelligence we want, and this information is transmitted. Not only the clocks, either the radio frequencies must match cycle by cycle, too. This provides another way to carry information if we want it.

And that's about all there is to this breakthrough, in principle. Of course the "minor details" include some pretty sticky problems, but we do have operating systems that do a fair job of applying these principles, and the future looks bright. Perhaps the main "minor detail" is in acquisition: *after* the PRNG's are tracking along in close correlation, everything is fine, but getting them lined up in the first place is troublesome. These controlled random codes have definite starting points in time; the clock frequency and phase are never known too exactly; and the radio frequency carrier—being flipped in phase—is also somewhat of a variable. The receiver has the real *a priori* key of the coded signal, but to use this key it must first search over the possible combinations of those variables—code start time, clock frequency and carrier frequency. This can take many minutes unless some clever tricks are used to speed things up. After the receiver locks on, everything is fine; it can hold the signal.

The fundamental idea of spectrum conservation as achieved by PRNG systems lies in the receiver's ability to "listen" to very small sections of the spectrum at just the right moments for the expected signal rather than to a larger portion of the spectrum all the time. A spectrum analyzer, which adds its own influence due to its narrow band filter memory, sees the PRNG signal as if it were scattered all up and down a wide portion of the spectrum. Small pieces of the signal seem to pop on and off here and there—just like noise. No wonder a regular receiver, filtering out a narrow portion of the spectrum, can't make head or tail of this mess, and sees only a little additional noise, if anything. It takes our special receiver with the particular and very specific code generator built in to be able to pick up all those little pieces of signal and re-assemble them.

The beautiful thing is that the same general portion of the spectrum can be used for many such PRNG transmissions. A receiver can recognize only its own code; all other codes simply don't correlate, and look like any other type of noise. You either get the right signal or you get nothing but noise. No cross-talk, ever. Yes,

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there is a distinct limit to how many PRNG transmissions can be carried simultaneously—we don't really get away with breaking all the laws of information theory. Each PRNG transmission does add to the total noise, and certainly some noise does get through the receiver's filter. This can disturb the quality of communication and even make the receiver lose its lock-on to the correct code.

These systems, in the final analysis, manage to conserve the spectrum by using the "dead time" between pulses of energy, and by eliminating the former practical need for "guard bands" of unused spectrum space around each signal to prevent interference. Ordinary filters just don't trim away adjacent frequencies sharply enough. The matched filter idea gets around this limitation.

One analogy, forgetting the time domain philosophy, might be to compare this method of signal recognition with those Ishihara color vision test cards. Scattered around in all sorts of colorful "noise" there is—or isn't—a nice plain Roman letter—if your eyes aren't color blind. With the right equipment you can tune in on the message just fine. But if you aren't able to distinguish red from green, all you see is an unorganized mess. The totally new method of separating and recognizing electrical signals by noisily scattering them all over the time domain instead of restraining them to clean-cut frequencies, is equivalent to learning how to recognize colors, or, say, polarized light.

Some electronics engineers in the audience might think I'm leading the rest of you astray on that question of modulation sidebands. I've said a tuned circuit can generate them at the receiver; they weren't necessarily generated at the transmitter. And I haven't mentioned Laplace transforms, a mighty useful tool mathematically relating time and frequency domains. We could have some interesting arguments on this, but it would resolve to the type of mathematical model set up, and doesn't really matter in this case. A Fourier analysis does provide a set of components that will synthesize the signal, but not the *only* possible set.

I'll hazard a prediction. Perhaps twenty years from now your tri-D set will tune to a specific pseudo random code rather than to a specific frequency when you switch from one space opera to another. Coded noise radar signals have already been bounced off Venus. If it's good enough for the old girl, it's good enough for us. ■

★ ★ ★ ★ ★

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Space Viking

Part II of IV parts.

Seeking out a particular fish in an ocean is easy compared to finding one deeply hated villain in space. He must be induced to seek you...

H. Beam Piper

Illustrated by Schoenherr

LUCAS TRASK and ELAINE KARVALL are very much in love, and very happy; tomorrow they will be married. Others are happy, for the marriage will unite two powerful baronies and place the wealth and fighting men of both behind Angus, Duke of Wardshaven, whose ambition is to make himself King of Gram. To many, Lord Trask among them, this seems the only alternative to planet-wide anarchy.

Gram is one of the Sword-Worlds, peopled by descendants of unreconstructed rebels who refused to surrender at the end of the System States War in the Ninth Century of the Atomic Era and took their defeated space navy far beyond the outer planets of the victorious Terran Federation to find freedom. On a dozen worlds, all named for fabulous swords of Old Terran legend, like Excalibur, Durendal, Morglay, Flamberge, they have developed a technologically advanced civilization, and a loosely feudal society enlivened by interbaronial skirmishing and dynastic wars.

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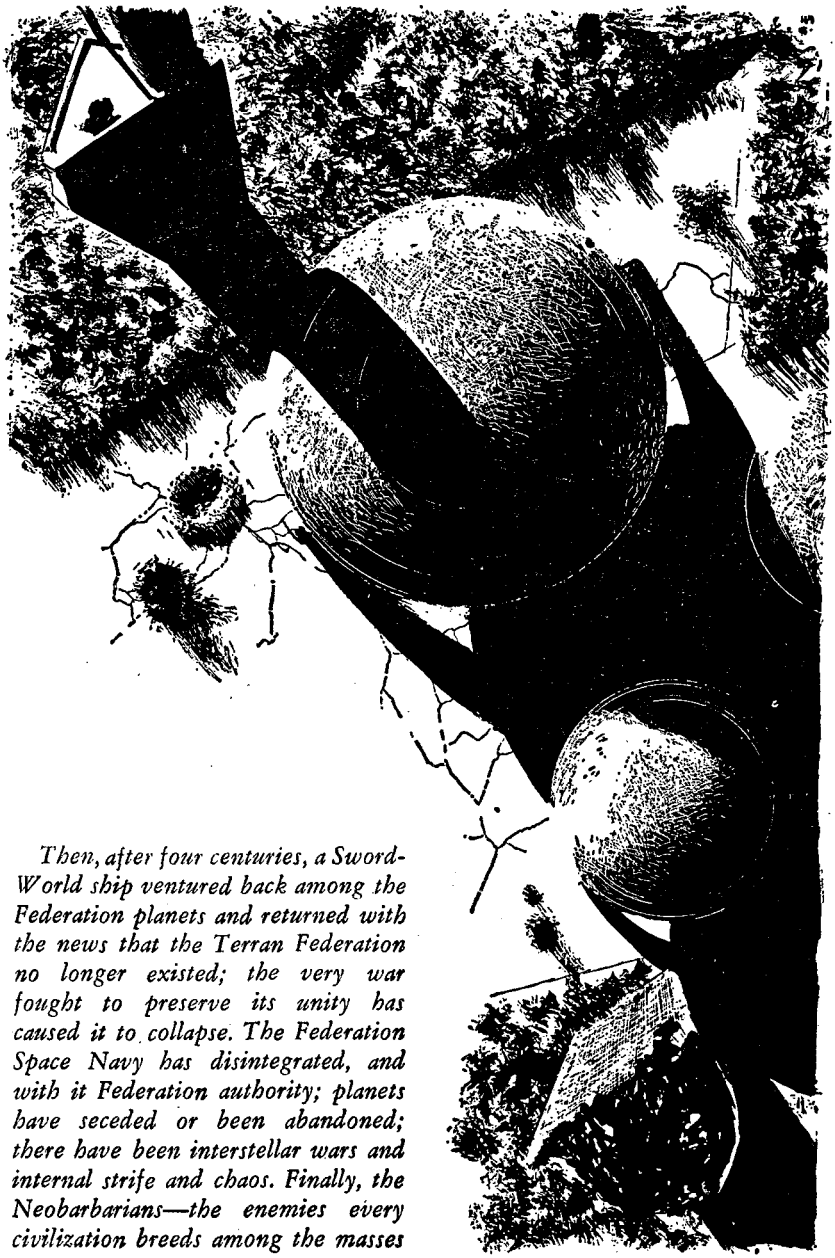

Then, after four centuries, a Sword-World ship ventured back among the Federation planets and returned with the news that the Terran Federation no longer existed; the very war fought to preserve its unity has caused it to collapse. The Federation Space Navy has disintegrated, and with it Federation authority; planets have seceded or been abandoned; there have been interstellar wars and internal strife and chaos. Finally, the Neobarbarians—the enemies every civilization breeds among the masses

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of its population—have risen, and the process of decivilization has begun.

A few Old Federation planets have retained their civilization intact; a few have sunk to Stone Age Savagery. Between these extremes are almost a thousand worlds neither too strong to be raided nor too decivilized to be worth raiding, and many afford rich booty. Sword-World ships begin going into the Old Federation to plunder where they can.

At first, they operate directly from the Sword-Worlds, returning between forays, but even with ships logging a light-year an hour in hyperspace, interstellar distances are too great. Within a century, the Space Vikings, as they are now calling themselves, are conquering decivilized planets and using them as bases inside the Old Federation, industrializing them to service their ships and, for the most part, never returning. Each ship to leave the Sword-Worlds carries away the best technicians, engineers, spacemen, fighting men: each succeeding Sword-World generation is begotten by fathers slightly inferior to the last. The whole level of Sword-World life is sinking, so slowly as to be imperceptible except to a thoughtful few.

One of these is Lord Trask of Traskon, who strongly supports Duke Angus' efforts to establish a planetary monarchy, but who deplores the Duke's Tanith Adventure, a project to establish a raiding base on a decivilized Federation planet three thousand light-years from Gram. The Duke has undertaken to build two spaceships at Wardshaven. One of these, the Enterprise, *is finished and ready for space. Work on the second has been halted for lack of funds. It is hoped that the* Enterprise *will bring back enough loot from the Old Federation to replenish the depleted treasury and pay for finishing the second ship. To command her, Angus has brought to Gram a veteran Space Viking, OTTO HARKAMAN.*

All spacemen have hobbies to relieve the boredom of inactivity in hyperspace; Harkaman's is history, and it is his conviction that anything that can possibly happen in a human civilization has already happened, in some form or another, somewhere and at some other time.

Duke Angus' psychopathic nephew, ANDRAY DUNNAN, has hoped to be given command of the Enterprise *himself. Disappointed, he has recruited a ragtag mercenary company, and is believed to be in communication with his uncle's worst enemy, Duke Omfray of Glaspyth. He is also insanely in love with Elaine Karvall, and has deluded himself that she reciprocates his feelings and is being forced into marriage with Trask by her parents and the Duke. On the afternoon before the wedding, he invades Karvall House, shouting insults and accusations and imploring Elaine to elope with him; he is forcibly removed by his henchman, Sir Nevil Ormm, who has accompanied him.*

The next day, at the conclusion of the wedding ceremony, Dunnan ap-

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pears alone in a stolen aircar and opens fire from it; trying to shield Elaine, Trask falls wounded.

When he recovers consciousness, he learns that Elaine has been killed, and that Dunnan, with his mercenaries, has pirated the Duke's ship Enterprise *and taken her to space. The Duke of Glaspyth is believed to have inspired the piracy of the ship, but the shooting at the wedding was Dunnan's own idea.*

Crushed by the death of his bride and wishing only to die himself, Trask is nevertheless started on the road to recovery by the doctors. Gradually, the determination to hunt Dunnan down and kill him furnishes him a purpose for which to live. He trades his entire barony for the second ship, which Duke Angus is to finish and equip for him, and throws himself into the work of readying her for space. His friends protest that he is stripping himself of everything he owns, but with Elaine dead, he wants nothing of Gram; after a lifetime of inveighing against Space Viking raiding, he is turning Space Viking himself.

Harkaman, left shipless by the piracy of the Enterprise, *agrees to command the new ship, the* Nemesis, *for Trask, and becomes Trask's mentor in the craft of interstellar piracy, and his devoted follower.*

When taken to space by Dunnan, the Enterprise *had aboard a cargo of industrial and construction machinery to be used in setting up a shipbase on Tanith; information reaches Gram that Dunnan has been recruiting engineers and technicians on another Sword-World, Curtana. Believing that Dunnan will try to forestall his uncle, whom he hates, by putting a base of his own on Tanith, Trask and Harkaman agree that they should begin their hunt for him there.*

Arriving on Tanith, they find two ships there, but they are the Space Scourge *and the* Lamia, *commanded, respectively, by BOAKE VALKANHAYN and GARVAN SPASSO; Valkanhayn, in an intership screen conversation, seems to think that the* Nemesis *is the* Enterprise, *and wants to know if Trask is the Duke of Wardshaven. This pair call themselves Space Vikings; real Space Vikings call them chicken thieves—raiders of low-grade planets whose inhabitants have nothing to fight with and nothing worth fighting for. Rumors of the Duke's Tanith adventure have filtered out to them, and they have rushed to Tanith hoping to bluff their way in on it. They talk truculently about defending their rights to Tanith, and are dismayed when Trask and Harkaman manifest no intention of challenging them.*

Dunnan has obviously gone somewhere else, but Trask decides to take the planet over and establish a base there himself. Dunnan may hear about it and attack; if he doesn't, enough information can be picked up from other Space Vikings using Tanith as a rendezvous to establish a predictable pattern for his movements. Then, some time, Dunnan will come out of hyperspace and find the Nemesis *waiting for him.*

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PART 2

They had Valkanhayn and Spasso aboard the *Nemesis* for dinner; it didn't take much guiding to keep the conversation on the subject of Tanith and its resources, advantages and possibilities. Finally, when they had reached brandy and coffee, Trask said idly:

"I believe, together, we could really make something out of this planet."

"That's what we've been telling you, all along," Spasso broke in eagerly. "This is a wonderful planet—"

"It could be. All it has now is possibilities. We'd need a spaceport, for one thing."

"Well, what's this, here?" Valkanhayn wanted to know.

"It was a spaceport," Harkaman told him. "It could be one again. And we'd need a shipyard, capable of any kind of heavy repair work. Capable of building a complete ship, in fact. I never saw a ship come into a Viking base planet with any kind of a cargo worth dickering over that hadn't taken some damage getting it. Prince Viktor of Xochitl makes a good half of his money on ship repairs, and so do Nikky Gratham on Jaganath and the Everrards on Hoth."

"And engine works, hyperdrive, normal space and pseudograv," Trask added. "And a steel mill, and a collapsed-matter plant. And robotic-equipment works, and—"

"Oh, that's out of all reason!" Valkanhayn cried. "It would take twenty trips with a ship the size of this one to get all that stuff here, and how'd we ever be able to pay for it?"

"That's the sort of base Duke Angus of Wardshaven planned. The *Enterprise,* practically a duplicate of the *Nemesis*, carried everything that would be needed to get it started, when she was pirated."

"When she was—?"

"Now you're going to have to tell the gentlemen the truth," Harkaman chuckled.

"I intend to." He laid his cigar down, sipped some of his brandy, and explained about Duke Angus' Tanith adventure. "It was part of a larger plan; Angus wanted to gain economic supremacy for Wardshaven to forward his political ambitions. It was, however, an entirely practical business proposition. I was opposed to it, because I thought it would be too good a proposition for Tanith and work to the disadvantage of the home planet in the end." He told them about the *Enterprise*, and the cargo of industrial and construction equipment she carried, and then told them how Andray Dunnan had pirated her.

"That wouldn't have annoyed me at all; I had no money invested in the project. What did annoy me, to put it mildly, was that just before he took the ship out, Dunnan shot up my wedding, wounded me and my father-in-law, and killed the lady to whom I had been married for less than half an hour. I fitted out this ship at my own expense, took on Captain Harkaman, who had been left without a command when the *Enterprise*

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was pirated, and came out here to hunt Dunnan down and kill him. I believe that I can do that best by establishing a base on Tanith myself. The base will have to be operated at a profit, or it can't be operated at all." He picked up the cigar again and puffed slowly. "I am inviting you gentlemen to join me as partners."

"Well, you still haven't told us how we're going to get the money to finance it," Spasso insisted.

"The Duke of Wardshaven, and the others who invested in the original Tanith adventure will put it up. It's the only way they can recover what they lost on the *Enterprise*."

"But then, this Duke of Wardshaven will be running it, not us," Valkanhayn objected.

"The Duke of Wardshaven," Harkaman reminded him, "is on Gram. We are here on Tanith. There are three thousand light-years between."

That seemed a satisfactory answer. Spasso, however, wanted to know who would run things here on Tanith.

"We'll have to hold a meeting of all three crews," he began.

"We will do nothing of the kind," Trask told him. "I will be running things here on Tanith. You people may allow your orders to be debated and voted on, but I don't. You will inform your respective crews to that effect. Any orders you give them in my name will be obeyed without argument."

"I don't know how the men'll take that," Valkanhayn said.

"I know how they'll take it if they're smart," Harkaman told him. "And I know what'll happen if they aren't. I know how you've been running your ships, or how your ships crews have been running you. Well, we don't do it that way. Lucas Trask is owner, and I'm captain. I obey his orders on what's to be done, and everybody else obeys mine on how to do it."

Spasso looked at Valkanhayn, then shrugged. "That's how the man wants it, Boake. You want to give him an argument? I don't."

"The first order," Trask said, "is that these people you have working here are to be paid. They are not to be beaten by these plug-uglies you have guarding them. If any of them want to leave, they may do so; they will be given presents and furnished transportation home. Those who wish to stay will be issued rations, furnished with clothing and bedding and so on as they need it, and paid wages. We'll work out some kind of a pay-token system and set up a commissary where they can buy things.

"Disks of plastic or titanium or something, stamped and uncounterfeitable. Get Alvyn Karffard to see about that. Organize work-gangs, and promote the best and most intelligent to foremen. And those guards could be taken in hand by some ground-fighter sergeant and given Sword-World weapons and tactical training; use them to train others; they'd need a sepoy army of some sort. Even the best of good will is no substitute for armed force, conspicuously displayed and unhesitatingly used when necessary.

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"And there'll be no more of this raiding villages for food or anything else. We will pay for anything we get from any of the locals."

"We'll have trouble about that," Valkanhayn predicted. "Our men think anything a local has belongs to anybody who can take it."

"So do I," Harkaman said. "On a planet I'm raiding. This is our planet, and our locals. We don't raid our own planet or our own people. You'll just have to teach them that."

X

It took Valkanhayn and Spasso more time and argument to convince their crews than Trask thought necessary. Harkaman seemed satisfied, and so was Baron Rathmore, the Wardshaven politician.

"It's like talking a lot of uncommitted small landholders into taking somebody's livery-and-maintenance," the latter said. "You can't use too much pressure; make them think it's their own idea."

There were meetings of both crews, with heated arguments; Baron Rathmore made frequent speeches, while Lord Trask of Tanith and Admiral Harkaman—the titles were Rathmore's suggestion—remained loftily aloof. On both ships, everybody owned everything in common, which meant that nobody owned anything. They had taken over Tanith on the same basis of diffused ownership, and nobody in either crew was quite stupid enough to think that they could do anything with the planet by themselves. By joining the *Nemesis*, it appeared that they were getting something for nothing. In the end, they voted to place themselves under the authority of Lord Trask and Admiral Harkaman. After all, Tanith would be a feudal lordship, and the three ships together a fleet.

Admiral Harkaman's first act of authority was to order a general inspection of fleet units. He wasn't shocked by the condition of the two ships, but that was only because he had expected much worse. They were spaceworthy; after all, they had gotten here from Hoth under their own power. They were only combat-worthy if the combat weren't too severe. His original estimate that the *Nemesis* could have knocked both of them to pieces was, if anything, over-conservative. The engines were only in fair shape, and the armament was bad.

"We aren't going to spend our time sitting here on Tanith," he told the two captains. "This planet is a raiding base, and 'raiding' is the operative word. And we are not going to raid easy planets. A planet that can be raided with impunity isn't worth the time it takes getting to it. We are going to have to fight on every planet we hit, and I am not going to jeopardize the lives of the men under me, which includes your crews as well as mine, because of under-powered and under-armed ships."

Spasso tried to argue. "We've been getting along."

Harkaman cursed. "Yes. I know how you've been getting along;

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chicken-stealing on planets like Set and Xipototec and Molkarth. Not making enough to cover maintenance expenses; that's why your ship's in the shape she is. Well, those days are over. Both ships ought to have a full overhaul, but we'll have to skip that till we have a shipyard of our own. But I will insist, at least, that your guns and launchers are in order. And your detection equipment; you didn't get a fix on the *Nemesis* till we were less than twenty thousand miles off-planet."

"We had better get the *Lamia* in condition first," Trask said. "We can put her on off-planet watch, instead of that pair of pinnaces."

Work on the *Lamia* started the next day, and considerable friction-heat was generated between her officers and the engineers sent over from the *Nemesis*. Baron Rathmore went aboard, and came back laughing.

"You know how that ship's run?" he asked. "There's a sort of soviet of officers; chief engineer, exec, guns-and-missiles, astrogator and so on. Spasso's just an animated ventriloquist's dummy. I talked to all of them. None of them can pin me down to anything, but they think we're going to heave Spasso out of command and appoint one of them, and each one thinks he'll be it. I don't know how long that'll last, it's a string-and-tape job like the one we're having to do on the ship. It'll hold till we get something better."

"We'll have to get rid of Spasso," Harkaman agreed. "I think we'll put one of our own people in his place. Valkanhayn can stay in command of the *Space Scourge*; he's a spaceman. But Spasso's no good for anything."

The local problem was complicated, too. The locals spoke Lingua Terra of a sort, like every descendant of the race that had gone out from the Sol system in the Third Century, but it was a barely comprehensible sort. On civilized planets, the language had been frozen unalterably in microbooks and voice tapes. But microbooks can only be read and sound tapes heard with the aid of electricity, and Tanith had lost that long ago.

Most of the people Spasso and Valkanhayn had kidnaped and enslaved came from villages within a radius of five hundred miles. About half of them wanted to be repatriated; they were given gifts of knives, tools, blankets, and bits of metal which seemed to be the chief standard of value and medium of exchange, and shipped home. Finding their proper villages was not easy. At each such village, the news was spread that the Space Vikings would hereafter pay for what they received.

The *Lamia* was overhauled as rapidly as possible. She was still far from being a good ship, but she was much closer being one than before. She was fitted with the best detection equipment that could be assembled, and put on orbit; Alvyn Karffard took command of her, with some of Spasso's officers, some of Valkanhayn's, and a few from the *Nemesis*. Harka-

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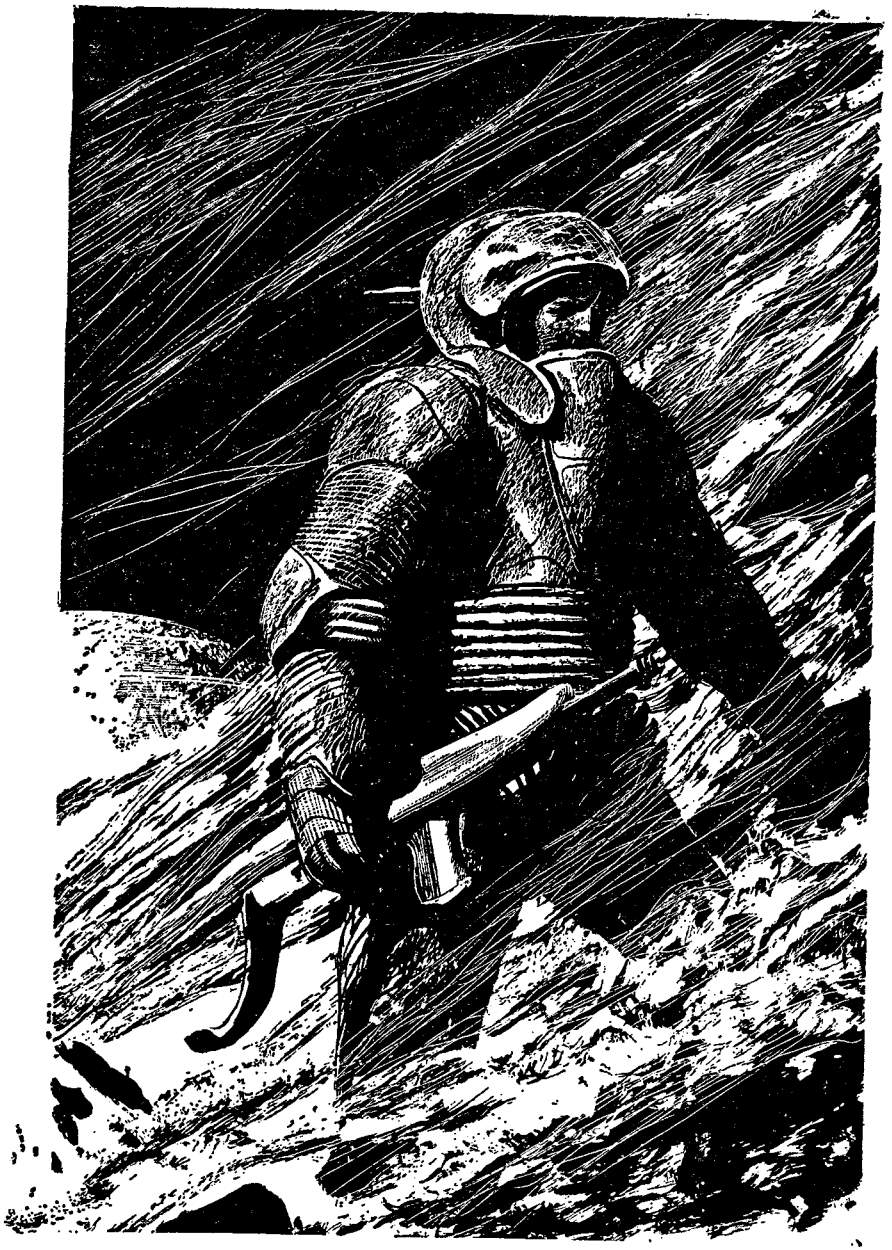

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man was intending to use her for retraining of all the *Lamia* and *Space Scourge* officers, and rotated them back and forth.

The labor guards, a score in number, were relieved of their duties, issued Sword-World firearms, and given intensive training. The trade tokens, stamps of colored plastic, were introduced, and a store was set up where they could be exchanged for Sword-World items. After a while, it dawned on the locals that the tokens could also be used for trading among themselves; money seemed to have been one of the adjuncts of civilization that had been lost along Tanith's downward path. A few of them were able to use contragravity hand-lifters and hand-towed lifter-skids; several were even learning to operate things like bulldozers, at least to the extent of knowing which lever or button did what. Give them a little time, Trask thought, watching a gang at work down on the spaceport floor. It won't be many years before half of them will be piloting aircars.

As soon as the *Lamia* was on orbital watch, the *Space Scourge* was set down at the spaceport and work started on her. It was decided that Valkanhayn would take her to Gram; enough *Nemesis* people would go along to insure good faith on his part, and to talk to Duke Angus and the Tanith investors. Baron Rathmore, and Paytrik Morland, and several other Wardshaven gentlemen-adventurers for the latter function; Alvyn Karffard to act as Valkanhayn's exec, with private orders to supersede him in command if necessary, and Guatt Kirbey to do the astrogating.

"We'll have to take the *Nemesis* and the *Space Scourge* out, first, and make a big raid," Harkaman said. "We can't send the *Space Scourge* back to Gram empty. When Baron Rathmore and Lord Valpry and the rest of them talk to Duke Angus and the Tanith investors, they'll have to have a lot more than some travel films of Tanith. They'll have to be able to show that Tanith is producing. We ought to have a little money of our own to invest, too."

"But, Otto; both ships?" That worried Trask. "Suppose Dunnan comes and finds nobody here but Spasso and the *Lamia*?"

"Chance we'll have to take. Personally, I think we have a year to a year and a half before Dunnan shows up here. I know, we were fooled trying to guess what he'd do before. But the sort of raid I have in mind, we'll need two ships, and in any case, I don't want to leave both those ships here while we're gone, even if you do."

"When it comes to that, I don't think I do, either. But we can't trust Spasso here alone, can we?"

"We'll leave enough of our people to make sure. We'll leave Alvyn—that'll mean a lot of work for me that he'd otherwise do, on the ship. And Baron Rathmore, and young Valpry, and the men who've been training our sepoys. We can shuffle things

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around and leave some of Valkanhayn's men in place of some of Spasso's. We might even talk Spasso into going along. That'll mean having to endure him at our table, but it would be wise."

"Have you picked a place to raid?"

"Three of them. First, Khepera. That's only thirty light-years from here. That won't amount to much; just chicken-stealing. It'll give our green hands some relatively safe combat-training, and it'll give us some idea of how Spasso's and Valkanhayn's people behave, and give them confidence for the next job."

"And then?"

"Amaterasu. My information about Amaterasu is about twenty years old. A lot of things can happen in twenty years. All I know of it—I was never there myself—is it's fairly civilized—about like Terra just before the beginning of the Atomic Era. No nuclear energy, they lost that, and of course nothing beyond it, but they have hydroelectric and solarelectric power, and nonnuclear jet aircraft, and some very good chemical-explosive weapons, which they use very freely on each other. It was last known to have been raided by a ship from Excalibur twenty years ago."

"That sounds promising. And the third planet?"

"Beowulf. We won't take enough damage on Amaterasu to make any difference there, but if we saved Amaterasu for last, we might be needing too many repairs."

"It's like that?"

"Yes. They have nuclear energy. I don't think it would be wise to mention Beowulf to Captains Spasso and Valkanhayn. Wait till we've hit Khepera and Amaterasu. They may be feeling like heroes, then."

XI

Khepera left a bad taste in Trask's mouth. He was still tasting it when the colored turbulence died out of the screen and left the gray nothingness of hyperspace. Garvan Spasso—they had had no trouble in inducing him to come along—was staring avidly at the screen as though he could still see the ravished planet they had left.

"That was a good one; that was a good one!" he was crowing. He's said that a dozen times since they had lifted out. "Three cities in five days, and all the stuff we gathered up around them. We took over two million stellars."

And did ten times as much damage getting it, and there was no scale of values by which to compute the death and suffering.

"Knock it off, Spasso. You said that before."

There was a time when he wouldn't have spoken to the fellow, or anybody else, like that. Gresham's law, extended: Bad manners drive out good manners. Spasso turned on him indignantly.

"Who do you think you are—?"

"He thinks he's Lord Trask of Tanith," Harkaman said. "He's right, too; he is." He looked searchingly at

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Trask for a moment, then turned back to Spasso. "I'm just as tired as he is of hearing you pop your mouth about a lousy two million stellars. Nearer a million and a half, but two million's nothing to pop about. Maybe it would be for the *Lamia*, but we have a three-ship fleet and a planetary base to meet expenses on. Out of this raid, a ground-fighter or an able spaceman will get a hundred and fifty stellars. We'll get about a thousand, ourselves. How long do you think we can stay in business doing this kind of chicken-stealing."

"You call this chicken-stealing?"

"I call it chicken-stealing, and so'll you before we get back to Tanith. If you live that long."

For a moment, Spasso was still affronted. Then, temporarily, his vulpine face showed avaricious hope, and then apprehension. Evidently he knew Otto Harkaman's reputation, and some of the things Harkaman had done weren't his idea of an easy way to make money.

Khepera had been easy; the locals hadn't had anything to fight with. Small arms, and light cannon which hadn't been able to fire more than a few rounds. Wherever they had attempted resistance, the combat cars had swooped in, dropping bombs and firing machine guns and auto-cannon. Yet they had fought, bitterly and hopelessly—just as he would have, defending Traskon.

Trask busied himself getting coffee and a cigarette from one of the robots. When he looked up, Spasso had gone away, and Harkaman was sitting on the edge of the desk, loading his short pipe.

"Well, you saw the elephant, Lucas," Harkaman said. "You don't seem to have liked it."

"Elephant?"

"Old Terran expression I read somewhere. All I know is that an elephant was an animal about the size of one of your Gram megatheres. The expression means, experiencing something for the first time which makes a great impression. Elephants must have been something to see. This was your first Viking raid. You've seen it, now."

He'd been in combat before; he'd led the fighting-men of Traskon during the boundary dispute with Baron Manniwel, and there were always bandits and cattle rustlers. He'd thought it would be like that. He remembered, five days, or was it five ages, ago, his excited anticipation as the city grew and spread in the screen and the *Nemesis* came dropping down toward it. The pinnaces, his four and the two from the *Space Scourge,* had gone spiraling out a hundred miles beyond the city; the *Space Scourge* had gone into a tighter circle twenty miles from its center; the *Nemesis* had continued her relentless descent until she was ten miles from the ground, before she began spewing out landing craft, and combat cars, and the little egg-shaped one-man air cavalry mounts. It had been thrilling. Everything had gone perfectly; not even Valkanhayn's gang had goofed.

Then the screenviews had begun

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coming in. The brief and hopeless fight in the city. He could still see that silly little field gun, it must have been around seventy or eighty millimeter, on a high-wheeled carriage, drawn by six shaggy, bandy-legged beasts. They had gotten it unlimbered and were trying to get it on a target when a rocket from an aircar landed directly under the muzzle. Gun, caisson, crew, even the draft team fifty yards behind, had simply vanished.

Or the little company, some of them women, trying to defend the top of a tall and half-ruinous building with rifles and pistols. One air-cavalryman wiped them all out with his machine guns.

"They don't have a chance," he'd said, half-sick. "But they keep on fighting."

"Yes; stupid of them, isn't it?" Harkaman, beside him, had said.

"What would you do in their place?"

"Fight. Try to kill as many Space Vikings as I could before they got me. Terra-humans are all stupid like that. That's why we're human."

If the taking of the city had been a massacre, the sack that had followed had been a man-made Hell. He had gone down, along with Harkaman, while the fighting, if it could be so called, was still going on. Harkaman had suggested that the men ought to see him moving about among them; for his own part, he had felt a compulsion to share their guilt.

He and Sir Paytrik Morland had been on foot together in one of the big hollow buildings that had stood since Khepera had been a Member Republic of the Terran Federation. The air was acrid with smoke, powder smoke and the smoke of burning. It was surprising, how much would burn, in this city of concrete and vitrified stone. It was surprising, too, how well-kept everything was, at least on the ground level. These people had taken pride in their city.

They found themselves alone, in a great empty hallway; the noise and horror of the sack had moved away from them, or they from it, and then, when they entered a side hall, they saw a man, one of the locals, squatting on the floor with the body of a woman cradled on his lap. She was dead, half her head had been blown off, but he was clasping her tightly, her blood staining his shirt, and sobbing heartbrokenly. A carbine lay forgotten on the floor beside him.

"Poor devil," Morland said, and started forward.

"No."

Trask stopped him with his left hand. With his right, he drew his pistol and shot the man dead. Morland was horrified.

"Great Satan, Lucas! Why did you do that?"

"I wish Andray Dunnan had done that for me." He thumbed the safety on and holstered the pistol. "None of this would be happening if he had. How many more happinesses do you think we've smashed here today? And we don't even have Dunnan's excuse of madness."

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The next morning, with everything of value collected and sent aboard, they had started cross-country for five hundred miles to another city, the first hundred over a countryside asmoke from burning villages Valkanhayn's men had pillaged the night before. There was no warning; Khepera had lost electricity and radio and telegraph, and the spread of news was at the speed of one of the beasts the locals insisted on calling horses. By midafternoon, they had finished with that city. It had been as bad as the first one.

One thing, it was the center of a considerable cattle country. The cattle were native to the planet, heavy-bodied unicorns the size of a Gram bisonoid or one of the slightly mutated Terran carabaos on Tanith, with long hair like a Terran yak. He had detailed a dozen of the *Nemesis* ground-fighters who had been vaqueros on his Traskon ranches to collect a score of cows and four likely bulls, with enough fodder to last them on the voyage. The odds were strongly against any of them living to acclimate themselves to Tanith, but if they did, they might prove to be one of the most valuable pieces of loot from Khepera.

The third city was at the forks of a river, like Tradetown on Tanith. Unlike it, this was a real metropolis. They should have gone there first of all. They spent two days systematically pillaging it. The Kheperans carried on considerable river-traffic, with stern-wheel steamboats, and the waterfront was lined with warehouses crammed with every sort of merchandise. Even better, the Kheperans had money, and for the most part it was gold specie, and the bank vaults were full of it.

Unfortunately, the city had been built since the fall of the Federation and the climb up from the barbarism that had followed, and a great deal of it was of wood. Fires started almost at once, and it was almost completely on fire by the end of the second day. It had been visible in the telescopic screen even after they were out of atmosphere, a black smear until the turning planet carried it into darkness and then a lurid glow.

"It was a filthy business."

Harkaman nodded. "Robbery and murder always are. You don't have to ask me who said that Space Vikings are professional robbers and murderers, but who was it said that he didn't care how many planets were raided and how many innocents massacred in the Old Federation?"

"A dead man. Lucas Trask of Traskon."

"You wish, now, that you'd kept Traskon and stayed on Gram?"

"No. If I had, I'd have spent every hour wishing I was doing what I'm doing now. I can get used to this, I suppose."

"I think you will. At least, you kept your rations down. I didn't on my first raid, and had bad dreams about it for a year." He gave his coffee cup back to the robot and got to his feet. "Get a little rest, for a couple of hours. Then draw some

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alcodote-vitamin pills from the medic. As soon as things are secured, there'll be parties all over the ship, and we'll be expected to look in on every one of them, have a drink, and say 'Well done, boys.'"

Elaine came to him, while he was resting. She looked at him in horror, and he tried to hide his face from her, and then realized that he was trying to hide it from himself.

XII

They came straight down on Eglonsby, on Amaterasu, the *Nemesis* and the *Space Scourge* side by side. The radar had picked them up at point-five light-seconds; by this time the whole planet knew they were coming, and nobody was wondering why. Paul Koreff was monitoring at least twenty radio stations, assigning somebody to each one as it was identified. What was coming in was uniformly excited, some panicky, and all in fairly standard Lingua Terra.

Garvan Spasso was perturbed. So, in the communication screen from the *Space Scourge,* was Boake Valkanhayn.

"They got radio, and they got radar," he clamored.

"Well, so what?" Harkaman asked. "They had radio and radar twenty years ago, when Rock Morgan was here in the *Coalsack.* But they don't have nuclear energy, do they?"

"Well, no. I'm picking up a lot of industrial electrical discharge, but nothing nuclear."

"All right. A man with a club can lick a man with his fists. A man with a gun can lick half a dozen with clubs. And two ships with nuclear weapons can lick a whole planet without them. Think it's time, Lucas?"

He nodded. "Paul, can you cut in on that Eglonsby station yet?"

"What are you going to do?" Valkanhayn wanted to know, against it in advance.

"Summon them to surrender. If they don't, we will drop a hellburner, and then we will pick out another city and summon it to surrender. I don't think the second one will refuse. If we are going to be murderers, we'll do it right, this time."

Valkanhayn was aghast, probably at the idea of burning an unlooted city. Spasso was sputtering something about, ". . . Teach the dirty Neobarbs a lesson—" Koreff told him he was switched on. He picked up a hand-phone.

"Space Vikings *Nemesis* and *Space Scourge,* calling the city of Eglonsby. Space Vikings . . ."

He repeated it for over a minute; there was no reply.

"Vann," he called Guns-and-Missiles. "A subcrit display job, about four miles over the city."

He laid the phone down and looked to the underside viewscreen. A little later, a silvery shape dropped away from the ship's south pole. The telescopic screen went off, and the unmagnified screen darkened as the filters went on. Valkanhayn, aboard the other ship, was shouting a warn-

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ing about his own screens. The only unfiltered screen aboard the *Nemesis* was the one tuned to the falling missile. The city of Eglonsby rushed upward in it, and then it went suddenly dark. There was an orange-yellow blaze in the other screens. After a while, the filters went off and the telescopic screen went on again. He picked up the phone.

"Space Vikings calling Eglonsby; this is your last warning. Communicate at once."

Less than a minute later, a voice came out of one of the speakers:

"Eglonsby calling Space Vikings. Your bomb has done great damage. Will you hold your fire until somebody in authority can communicate with you? This is the chief operator at the central State telecast station; I have no authority to say anything to you, or discuss anything."

"Oh, good, that sounds like a dictatorship," Harkaman was saying. "Grab the dictator and shove a pistol in his face and you have everything."

"There is nothing to discuss. Get somebody who has authority to surrender the city to us. If this is not done within the hour, the city and everybody in it will be obliterated."

Only minutes later, a new voice said:

"This is Gunsalis Jan, secretary to Pedrosan Pedro, President of the Council of Syndics. We will switch President Pedrosan over as soon as he can speak directly to the personage in supreme command of your ships."

"That is myself; switch him to me at once."

After a delay of less than fifteen seconds they had President Pedrosan Pedro.

"We are prepared to resist, but we realize what this would cost in lives and destruction of property," he began.

"You don't begin to. Do you know anything about nuclear weapons?"

"From history; we have no nuclear power of any sort. We can find no fissionables on this planet."

"The cost, as you put it, would be everything and everybody in Eglonsby and for a radius of almost a hundred miles. Are you still prepared to resist?"

The President of the Council of Syndics wasn't and said so. Trask asked him how much authority his position gave him.

"I have all powers in any emergency. I think," the voice added tonelessly, "that this is an emergency. The council will automatically ratify any decision I make."

Harkaman depressed a button in front of him. "What I said; dictatorship, with parliamentary false front."

"If he isn't a false-front dictator for some oligarchy." He motioned to Harkaman to take his thumb off the button. "How large is this Council?"

"Sixteen, elected by the Syndicates they represent. There is the Syndicate of Labor, the Syndicate of Manufacturers, the Syndicate of Small Businesses, the . . ."

"Corporate State, First Century Pre-Atomic on Terra. Benny the Moose," Harkaman said. "Let's all go down and talk to them."

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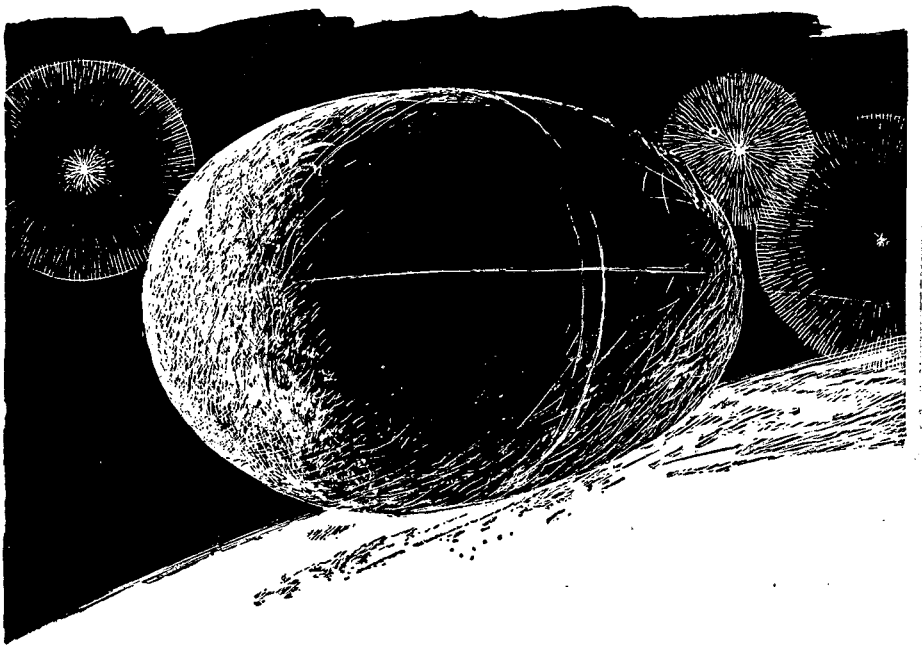

When they were sure that the public had been warned to make no resistance, the *Nemesis* went down to two miles, bulking over the center of the city. The buildings were low by the standards of a contragravity-using people, the highest barely a thousand feet and few over five hundred, and they were more closely set than Sword-Worlders were accustomed to, with broad roadways between. In several places there were queer arrangements of crossed roadways, apparently leading nowhere. Harkaman laughed when he saw them.

"Airstrips. I've seen them on other planets where they've lost contragravity. For winged aircraft powered by chemical fuel. I hope we have time for me to look around, here. I'll bet they even have railroads here."

The "great damage" caused by the bomb was about equal to the effect of a medium hurricane; he had seen worse from high winds at Traskon. Mostly it had been moral, which had been the kind intended.

They met President Pedrosan and the council of Syndics in a spacious and well-furnished chamber near the top of one of the medium-high buildings. Valkanhayn was surprised; in a loud aside he considered that these people must be almost civilized. They

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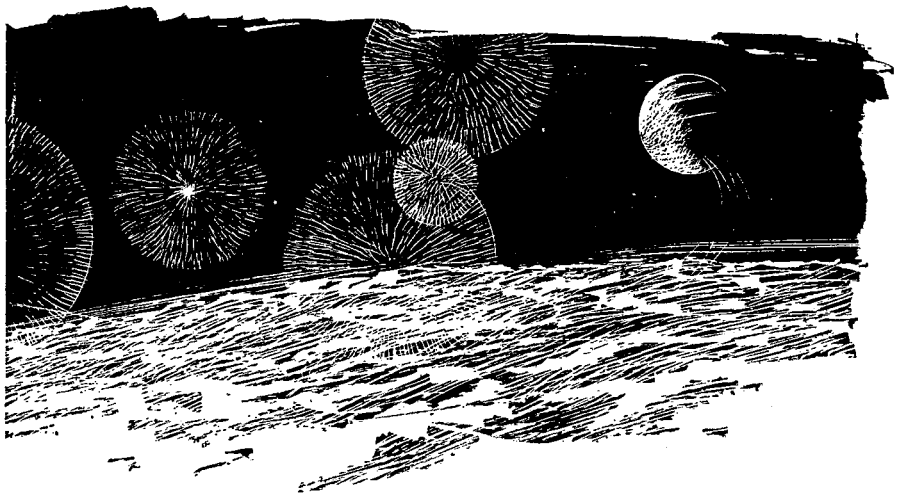

were introduced. Amaterasun surnames preceded personal names, which hinted at a culture and a political organization making much use of registration by alphabetical list. They all wore garments which had the indefinable but unmistakable appearance of uniforms. When they had all seated themselves at a large oval table, Harkaman drew his pistol and used the butt for a gavel.

"Lord Trask, will you deal with these people directly?" he asked, stiffly formal.

"Certainly, Admiral." He spoke to the President, ignoring the others. "We want it understood that we control this city, and we expect complete submission. As long as you remain submissive to us, we will do no damage beyond removal of the things we wish to take from it, and there will be no violence to any of your people, or any indiscriminate vandalism. This visit we are paying you will cost you heavily, make no mistake about that, but whatever the cost, it will be a cheap price for avoiding what we might otherwise do."

The President and the Syndics exchanged relieved glances. Let the taxpayers worry about the cost; they'd come out of it with whole skins.

"You understand, we want maxi-

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mum value and minimum bulk," he continued. "Jewels, objects of art, furs, the better grades of luxury goods of all kinds. Rare-element metals. And monetary metals, gold and platinum. You have a metallic-based currency, I suppose?"

"Oh, no!" President Pedrosan was slightly scandalized. "Our currency is based on services to society. Our monetary unit is simply called a credit."

Harkaman snorted impolitely. Evidently he'd seen economic systems like that before. Trask wanted to know if they used gold or platinum at all.

"Gold, to some extent, for jewelry." Evidently they weren't complete economic puritans. "And platinum in industry, of course."

"If they want gold, they should have raided Stolgoland," one of the Syndics said. "They have a gold-standard currency." From the way he said it, he might have been accusing them of eating with their fingers, and possibly of eating their own young.

"I know, the maps we're using for this planet are a few centuries old; Stolgoland doesn't seem to appear on them."

"I wish it didn't appear on ours, either." That was General Dagró Ector, Syndic for State Protection.

"It would have been a good thing for this whole planet if you'd decided to raid them instead of us," somebody else said.

"It isn't too late for these gentlemen to make that decision," Pedrosan said. "I gather that gold is a monetary metal among your people?" When Trask nodded, he continued: "It is also the basis of the Stolgonian currency. The actual currency is paper, theoretically redeemable in gold. In actuality, the circulation of gold has been prohibited, and the entire gold wealth of the nation is concentrated in vaults at three depositories. We know exactly where they are."

"You begin to interest me, President Pedrosan."

"I do? Well, you have two large spaceships and six smaller craft. You have nuclear weapons, something nobody on this planet has. You have contragravity, something that is hardly more than a legend here. On the other hand, we have a million and a half ground-troops, jet aircraft, armored ground-vehicles, and chemical weapons. If you will undertake to attack Stolgoland, we will place this entire force at your disposal; General Dagró will command them as you direct. All that we ask is that, when you have loaded the gold hoards of Stolgoland aboard your ships, you will leave our troops in possession of the country."

That was all there was to that meeting. There was a second one; only Trask, Harkaman and Sir Paytrik Morland represented the Space Vikings, and the Eglonsby government was represented by President Pedrosan and General Dagró. They met more intimately, in a smaller and more luxurious room in the same building.

"If you're going to declare war on

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Stolgoland, you'd better get along with it," Morland advised.

"What?" Pedrosan seemed to have only the vaguest idea of what he was talking about. "You mean, warn them? Certainly not. We will attack them by surprise. It will be nothing but plain self-defense," he added righteously. "The oligarchic capitalists of Stolgoland have been plotting to attack us for years."

"Yes. If you had carried out your original intention of looting Eglonsby, they would have invaded us the moment your ships lifted out. It's exactly what I'd do in their place."

"But you maintain nominally friendly relations with them?"

"Of course. We are civilized. The peace-loving government and people of Eglonsby . . ."

"Yes, Mr. President; I understand. And they have an embassy here?"

"They call it that!" cried Dagró. "It is a nest of vipers, a plague-spot of espionage and subversion . . . !"

"We'll grab that ourselves, right away," Harkaman said. "You won't be able to round up all their agents outside it, and if we tried to, it would cause suspicion. We'll have to put up a front to deceive them."

"Yes. You will go on the air at once, calling on the people to collaborate with us, and you will specifically order your troops mobilized to assist us in collecting the tribute we are levying on Eglonsby," Trask said. "In that way, if any Stolgonian spies see your troops concentrated around our landing craft, they'll think it's to help us load our loot."

"And we'll announce that a large part of the tribute will consist of military equipment," Dagró added. "That will explain why our guns and tanks are being loaded on your contragravity vehicles."

When the Stolgonian embassy was seized by the Space Vikings, the ambassador asked to be taken at once to their leader. He had a proposition: If the Space Vikings would completely disable the army of Eglonsby and admit Stolgonian troops when they were ready to leave, the invaders would bring with them ten thousand kilos of gold. Trask affected to be very hospitable to the offer.

Stolgoland lay across a narrow and shallow sea from the State of Eglonsby; it was dotted with islands, and every one of them was, in turn, dotted with oil wells. Petroleum was what kept the aircraft and ground-vehicles of Amaterasu in operation; oil, rather than ideology, was at the root of the enmity between the two nations. Apparently the Stolgonian espionage in Eglonsby was completely deceived, and the reports Trask allowed the captive ambassador to make confirmed the deception. Hourly the Eglonsby radio stations poured out exhortations to the people to co-operate with the Space Vikings, with an occasional lamentation about the masses of war materials being taken. Eglonsby espionage in Stolgoland was similarly active. The Stolgonian armies were being massed at four seaports on the coast facing Eglonsby, and there was a

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frantic gathering of every sort of ship available. By this time, any sympathy that Trask might have felt for either party had evaporated.

The invasion of Stolgoland started the fifth morning after their arrival over Eglonsby. Before dawn, the six pinnaces went in, making a wide sweep around the curvature of the planet and coming in from the north, two to each of the three gold-troves. They were detected by radar, eventually but too late for any effective resistance to be organized. Two were even taken without a shot; by mid-morning all three had been blown open and the ingots and specie were being removed.

The four seaports from whence the Stolgonian invasion of Eglonsby was to have been launched were neutralized by nuclear bombing. Neutralized was a nice word, Trask thought; there was no echo in it of the screams of the still-living, maimed and burned and blinded, around the fringes of ground-zero. The *Nemesis* and the *Space Scourge,* from landing craft and from the ships themselves, landed Eglonsby troops on Stolgonopolis. While they were sacking the city, with all the usual atrocities, the Space Vikings were loading the gold, and anything else that was of more than ordinary value, aboard the ships.

They were still at it the next morning when President Pedrosan arrived at the newly conquered capital, announcing his intention of putting the Stolgonian chief of state and his cabinet on trial as war criminals. Before sunset, they were back over Eglonsby. The loot might run as high as a half-billion Excalibur stellars. Boake Valkanhayn and Garvan Spasso were simply beyond astonishment and beyond words.

The looting of Eglonsby then began.

They gathered up machinery, and stocks of steel and light-metal alloys. The city was full of warehouses, and the warehouses were crammed with valuables. In spite of the socialistic and egalitarian verbiage behind which the government operated, there seemed to be a numerous elite class and if gold were not a monetary metal it was not despised for purposes of ostentation. There were several large art museums. Vann Larch, their nearest approach to an art specialist, took charge of culling the best from them.

And there was a vast public library. Into this Otto Harkaman vanished, with half a dozen men and a contragravity scow. Its historical section would be much poorer in the future.

President Pedrosan Pedro was on the radio from Stolgonopolis that night.

"Is this how you Space Vikings keep faith?" he demanded indignantly. "You've abandoned me and my army here in Stolgoland, and you're sacking Eglonsby. You promised to leave Eglonsby alone if I helped you get the gold of Stolgoland."

"I promised nothing of the kind.

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I promised to help you take Stolgoland. You've taken it," Trask told him. "I promised to avoid unnecessary damage or violence. I've already hanged a dozen of my own men for rape, murder and wanton vandalism. Now, we expect to be out of here in twenty-four hours. You'd better be back here before then. Your own people are starting to loot. We did not promise to control them for you."

That was true. What few troops had been left behind, and the police, were unable to cope with the mobs that were pillaging in the wake of the Space Vikings. Everybody seemed to be trying to grab what he could and let the Vikings be blamed for it. He had been able to keep his own people in order. There had been at least a dozen cases of rape and wanton murder, and the offenders had been promptly hanged. None of their shipmates, not even the *Space Scourge* company, seemed resentful. They felt the culprits had deserved what they'd gotten; not for what they'd done to the locals, but for disobeying orders.

A few troops had been flown in from Stolgoland by the time they had gotten their vehicles stowed and were lifting out. They didn't seem to be making much headway. Harkaman, who had gotten his load of microbooks stowed and was at the command desk, laughed heartily.

"I don't know what Pedrosan'll do. Gehenna, I don't even know what I'd do, if I'd gotten myself into a mess like that. He'll probably bring half his army back, leave the other half in Stolgoland, and lose both. Suppose we drop in, in about three or four years, just out of curiosity. If we make twenty per cent of what we did this time, the trip would pay for itself."

After they went into hyperspace and had the ship secured, the parties lasted three Galactic standard days, and nobody was at all sober. Harkaman was drooling over the mass of historical material he had found. Spasso was jubilant. Nobody could call this chicken-stealing. He kept repeating that as long as he was able to say anything. Khepera, he conceded, had been. Lousy two or three million stellars; poo!

XIII

Beowulf was bad.

Valkanhayn and Spasso had both been opposed to the raid. Nobody raided Beowulf; Beowulf was too tough. Beowulf had nuclear energy and nuclear weapons and contragravity and normal-space craft, they even had colonies on a couple of other planets of their system. They had everything but hyperdrive. Beowulf was a civilized planet, and you didn't raid civilized planets, not and get away with it.

And beside, hadn't they gotten enough loot on Amaterasu?

"No, we did not," Trask told them. "If we're going to make anything out of Tanith, we're going to need power, and I don't mean windmills and waterwheels. As you've remarked,

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Beowulf has nuclear energy. That's where we get our plutonium and our power units."

So they went to Beowulf. They came out of hyperspace eight light-hours from the F-7 star of which Beowulf was the fourth planet, and twenty light-minutes apart. Guatt Kirbey made a microjump that brought the ships within practical communicating distance, and they began making plans in an intership screen conference.

"There are, or were, three chief sources of fissionable ores," Harkaman said. "The last ship to raid here and get away was Stefan Kintour's *Princess of Lyonesse,* sixty years ago. He hit one on the Antarctic continent; according to his account, everything there was fairly new. He didn't mess things up too badly, and it ought to be still operating. We'll go in from the south pole, and we'll have to go in fast."

They shifted personnel and equipment. They would go in bunched, the pinnaces ahead; they and the *Space Scourge* would go down to the ground, while the better-armed *Nemesis* would hover above to fight off local contragravity, shoot down missiles, and generally provide overhead cover. Trask transferred to the *Space Scourge,* taking with him Morland and two hundred of the *Nemesis* ground-fighters. Most of the single-mounts, landing craft and manipulators and heavy-duty lifters went with him, jamming the decks around the vehicle ports of Valkanhayn's ship.

They jumped in to six light-minutes, and while Valkanhayn's astrogator was still fiddling with his controls they began sensing radar and microray detection. When they came out again, they were two light-seconds off the south pole, and half a dozen ships were either in orbit or coming up from the planet. All normal-space craft, of course, but some were almost as big as the *Nemesis.*

From there on, it was a nightmare.

Ships pounded at them with guns, and they pounded back. Missiles went out, and counter-missiles stopped them in rapidly expanding and quickly vanishing globes of light. Red lights flashed on the damage board, and sirens howled and klaxons squawked. In the outside-view screens, they saw the *Nemesis* vanish in a blaze of radiance, and then, while their hearts were still in their throats, come out of it again. Red lights went off on the board as damage-control crews and their robots sealed the breaches in the hull and pumped air back into evacuated areas, and then more red lights came on.

Occasionally, he would glance toward Boake Valkanhayn, who sat motionless in his chair, chewing a cigar that had gone out long ago. He wasn't enjoying it, but he wasn't showing fear. Once a Beowulfer vanished in a supernova flash, and when the ball of incandescence widened to nothing the ship was gone. All Valkanhayn said was: "Hope one of our boys did that."

They fought their way in and

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down, toward the atmosphere. Another Beowulf ship blew up, a craft about the size of Spasso's *Lamia.* A moment later, another; Valkanhayn was pounding the desk in front of him with his fist and yelling: "That was one of ours! Find out who launched it; get his name!"

Missiles were coming up from the planet, now. Valkanhayn's detection officer was trying to locate the source. While he was trying, a big melon-shaped thing fell away from the *Nemesis,* and in the jiggling, radiation-distorted intership screen Harkaman's image was laughing.

"Hellburner just went off; target about 50° south, 25° east of the sunrise line. That's where those missiles are coming from."

Counter-missiles sped toward the big metal melon; defense missiles, robot-launched, met them. The hellburner's track was marked first by expanding red and orange globes in airless space and then by fire-puffs after it entered atmosphere. It vanished into the darkness beyond the sunset, and then made sunlight of its own. It *was* sunlight; a Bethe solar-phoenix reaction, and it would sustain itself for hours. He hoped it hadn't landed within a thousand miles of their objective.

The ground operation was a nightmare of a different sort. He went down in a command car, with Paytrik Morland and a couple of others. There were missiles and gun batteries. There were darting patterns of flights of combat vehicles, blazing gunfire, and single vehicles that shot past or blew up in front of them. Robots on contragravity—military robots, with missiles to launch, and working robots with only their own mass to hurl, flung themselves mindlessly at them. Screens that went crazy from radiation; speakers that jabbered contradictory orders. Finally, the battle, which had raged in the air over two thousand square miles of mines and refineries and reaction plants, became two distinct and concentrated battles, one at the packing plant and storage vaults and one at the power-unit cartridge factory.

Three pinnaces came down to form a triangle over each; the *Space Scourge* hung midway between, poured out a swarm of vehicles and big claw-armed manipulators; armored lighters and landing craft shuttled back and forth. The command car looped and dodged from one target to the other; at one, keg-like canisters of plutonium, collapsium-plated and weighing tons apiece, were coming out of the vaults, and at the other lifters were bringing out loads of nuclear-electric power-unit cartridges, some as big as a ten liter jar, to power a spaceship engine, and some small as a round of pistol ammunition, for things like flashlights.

Every hour or so, he looked at his watch, and it would be three or four minutes later.

At last, when he was completely convinced that he had really been killed, and was damned and would spend all eternity in this fire-riven

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chaos, the *Nemesis* began firing red flares and the speakers in all the vehicles were signaling recall. He got aboard the *Space Scourge* somehow, after assuring himself that nobody who was alive was left behind.

There were twenty-odd who weren't, and the sick bay was full of wounded who had gone up with cargo, and more were being helped off the vehicles as they were berthed. The car in which he had been riding had been hit several times, and one of the gunners was bleeding under his helmet and didn't seem aware of it. When he got to the command room, he found Boake Valkanhayn, his face drawn and weary, getting coffee from a robot and lacing it with brandy.

"That's it," he said, blowing on the steaming cup. It was the battered silver one that had been in front of him when he had first appeared in the *Nemesis*' screen. He nodded toward the damage screen; everything had been patched up, or the outer decks around breached portions of the hull sealed. "Ship secure." He set down the silver mug and lit a cigar. "To quote Garvan Spasso, 'Nobody can call that chicken-stealing.' "

"No. Not even if you count Tizona giraffe-birds as chickens. That Gram gum-pear brandy you're putting in that coffee? I'll have the same. Just leave out the coffee."

XIV

The *Lamia*'s detection picked them up as soon as they were out of the last microjump; Trask's gnawing fear that Dunnan might attack in their absence had been groundless. Incredibly, he realized, they had been gone only thirty-odd Galactic Standard days, and in that time Alvyn Karffard had done an incredible amount of work.

He had gotten the spaceport completely cleared of rubble and debris, and he had the woods cleared away from around it and the two tall buildings. The locals called the city Rivvin; a few inscriptions found here and there in it indicated that the original name had been Rivington. He had done considerable mapping, in some detail of the continent on which it was located and, in general, of the rest of the planet. And he had established friendly relations with the people of Tradetown and made friends with their king.

Nobody, not even those who had collected it, quite believed their eyes when the loot was unloaded. The little herd of long haired unicorns—the Khepera locals had called them kreggs, probably a corruption of the name of some naturalist who had first studied them—had come through the voyage and even the Battle of Beowulf in good shape. Trask and a few of his former cattlemen from Traskon watched them anxiously, and the ship's doctor, acting veterinarian, made elaborate tests of vegetation they would be likely to eat. Three of the cows proved to be with calf; these were isolated and watched over with especial solicitude.

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The locals were inclined to take a poor view of the kreggs, at first. Cattle ought to have two horns, one on either side, curved back. It wasn't right for cattle to have only one horn, in the middle, slanting forward.

Both ships had taken heavy damage. The *Nemesis* had one pinnace berth knocked open, and everybody was glad the Beowulfers hadn't noticed that and gotten a missile inside. The *Space Scourge* had taken a hit directly on her south pole while lifting out from the planet, and a good deal of the southern part of the ship was sealed off when she came in. The *Nemesis* was repaired as far as possible and put on off-planet patrol, then they went to work on the *Space Scourge,* transferring much of her armament to ground defense, clearing out all the available cargo space, and repairing her hull as far as possible. To repair her completely was a job for a regular shipyard, like Alex Gorram's on Gram. And that was where the work would be done.

Boake Valkanhayn would command her on the voyage to and from Gram. Since Beowulf, Trask had not only ceased to dislike the man, but was beginning to admire him. He had been a good man once, before ill fortune which had been only partly of his own making had overtaken him. He'd just let himself go and stopped caring. Now he had taken hold of himself again. It had started showing after they had landed on Amaterasu. He had begun to dress more neatly and speak more grammatically; to look and act more like a spaceman and less like a barfly. His men had begun to jump to obey when he gave an order. He had opposed the raid on Beowulf, but that had been the dying struggle of the chicken-thief he had been. He had been scared, going in; well, who hadn't been, except a few greenhorns brave with the valor of ignorance. But he had gone in, and fought his ship well, and had held his station over the fissionables plant in a hell of bombs and missile, and he had made sure everybody who had gone down and who was still alive was aboard before he lifted out.

He was a Space Viking again.

Garvan Spasso wasn't, and never would be. He was outraged when he heard that Valkanhayn would take his ship, loaded with much of the loot of the three planets, to Gram. He came to Trask, fairly spluttering about it.

"You know what'll happen?" he demanded. "He'll space out with that cargo, and that'll be the last any of us'll hear of him again. He'll probably take it to Joyeuse or Excalibur and buy himself a lordship with it."

"Oh, I doubt that, Garvan. A number of our people are going along—Guatt Kirbey will be the astrogator; you'd trust him, wouldn't you? And Sir Paytrik Morland, and Baron Rathmore, and Lord Valpry, and Rolve Hemmerding . . ." He was silent for a moment, struck by an idea. "Would you be willing to make the trip in the *Space Scourge,* too?"

Spasso would, very decidedly. Trask nodded.

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"Good. Then we'll be sure nothing crooked is pulled," he said seriously.

After Spasso was gone, he got in touch with Baron Rathmore.

"See to it that he gets as much money that's due him as possible, when you get to Gram. And ask Duke Angus, as a favor to give him some meaningless position with a suitably impressive title, Lord Chamberlain of the Ducal Washroom, or something. Then he can prime him with misinformation and give him an opportunity to sell it to Omfray of Glaspyth. Then, of course, he could be contacted to sell Omfray out to Angus. A couple of times around and somebody'll stick a knife in him, and then we'll be rid of him for good."

They loaded the *Space Scourge* with gold from Stolgoland, and paintings and statues from the art museums and fabrics and furs and jewels and porcelains and plate from the markets of Eglonsby. They loaded sacks and kegs of specie from Khepera. Most of the Khepera loot wasn't worth hauling to Gram, but it was far enough in advance of their own technologies to be priceless to the Tanith locals.

Some of these were learning simple machine operations, and a few were able to handle contragravity vehicles that had been fitted with adequate safety devices. The former slave guards had all become sergeants and lieutenants in an infantry regiment that had been formed, and the King of Tradetown borrowed some to train his own army. Some genius in the machine shop altered a matchlock musket to flintlock and showed the local gunsmiths how to do it.

The kreggs continued to thrive, after the *Space Scourge* departed. Several calves were born, and seemed to be doing well; the biochemistry of Tanith and Khepera were safely alike. Trask had hopes for them. Every Viking ship had its own carniculture vats, but men tired of carniculture meat, and fresh meat was always in demand. Some day, he hoped, kregg-beef would be an item of sale to ships putting in on Tanith, and the long-haired hides might even find a market in the Sword-Worlds. They had contragravity scows plying between Rivington and Tradetown regularly, now, and air-lorries were linking the villages. The boatmen of Tradetown rioted occasionally against this unfair competition. And in Rivington itself, bulldozers and power shovels and manipulators labored, and there was always a rising cloud of dust over the city.

There was so much to do, and only a trifle under twenty-five Galactic Standard hours in a day to do it. There were whole days in which he never thought once of Andray Dunnan.

A hundred and twenty-five days to Gram, and a hundred and twenty-five days back. They had long ago passed. Of course, there would be the work of repairing the *Space Scourge,* the conferences with the investors in the

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original Tanith Adventure, the business of gathering the needed equipment for the new base. Even so, he was beginning to worry a little. Worry about something as far out of his control as the *Space Scourge* was useless, he knew. He couldn't help it, though. Even Harkaman, usually imperturbable, began to be fretful, after two hundred and seventy days had passed.

They were relaxing in the living quarters they had fitted out at the top of the spaceport building before retiring, both sprawled wearily in chairs that had come from one of the better hotels of Eglonsby, their drinks between them on a low table, the top of which was inlaid with something that looked like ivory but wasn't. On the floor beside it lay the plans for a reaction-plant and mass-energy converter they would build as soon as the *Space Scourge* returned with equipment for producing collapsium-plated shielding.

"Of course, we could go ahead with it, now," Harkaman said. "We could tear enough armor off the *Lamia* to shield any kind of a reaction plant."

That was the first time either of them had gotten close to the possibility that the ship mightn't return. Trask laid his cigar in the ashtray—it had come from President Pedrosan Pedro's private office—and splashed a little more brandy into his glass.

"She'll be coming before long. We have enough of our people aboard to make sure nobody else tries to take the ship. And I really believe, now, that Valkanhayn can be trusted."

"I do, too. I'm not worried about what might happen on the ship. But we don't know what's been happening on Gram. Glaspyth and Didreksburg could have teamed up and jumped Wardshaven before Duke Angus was ready to invade Glaspyth. Boake might be landing the ship in a trap at Wardshaven."

"Be a sorry looking trap after it closed on him. That would be the first time in history that a Sword-World was raided by Space Vikings." Harkaman looked at his half-empty glass, then filled it to the top. It was the same drink he had started with, just as a regiment that has been decimated and recruited up to strength a few times is still the same regiment.

The buzz of the communication screen—one of the few things in the room that hadn't been looted somewhere—interrupted him. They both rose; Harkaman, still carrying his drink, went to put it on. It was a man on duty in the control room, overhead, reporting that two emergences had just been detected at twenty light-minutes due north of the planet. Harkaman gulped his drink and set down the empty glass.

"All right. You put out a general alert? Switch anything that comes in over to this screen." He got out his pipe and was packing tobacco into it mechanically. "They'll be out of the last microjump and about two light-seconds away in a few minutes."

Trask sat down again, saw that his cigarette had burned almost to the tip, and lit a fresh one from it, wish-

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ing he could be as calm about it as Harkaman. Three minutes later, the control tower picked up two emergences at a light-second and a half, a thousand or so miles apart. Then the screen flickered, and Boake Valkanhayn was looking out of it, from the desk in the newly refurbished command room of the *Space Scourge.*

He was a newly refurbished Boake Valkanhayn, too. His heavily braided captain's jacket looked like the work of one of the better tailors on Gram, and on the breast was a large and ornate knight's star, of unfamiliar design, bearing, among other things, the sword and atom-symbol of the house of Ward.

"Prince Trask; Count Harkaman," he greeted. "*Space Scourge,* Tanith; thirty-two hundred hours out of Wardshaven on Gram, Baron Valkanhayn commanding, accompanied by chartered freighter *Rozinante,* Durendal, Captain Morbes. Requesting permission and instructions to orbit in."

"Baron Valkanhayn?" Harkaman asked.

"That's right," Valkanhayn grinned. "And I have a vellum scroll the size of a blanket to prove it. I have a whole cargo of scrolls. One says you're Otto, Count Harkaman, and another says you're Admiral of the Royal Mardukan Navy."

"He did it!" Trask cried. "He made himself King of Gram!"

"That's right. And you're his trusty and well-loved Lucas, Prince Trask, and Viceroy of his Majesty's Realm of Tanith."

Harkaman bristled at that. "The Gehenna you say. This is *our* Realm of Tanith."

"Is his Majesty making it worth while to accept his sovereignty?" Trask asked. "That is, beside vellum scrolls?"

Valkanhayn was still grinning. "Wait till we start sending cargo down. And wait till you see what's crammed into the other ship."

"Did Spasso come back with you?" Harkaman asked.

"Oh, no. Sir Garvan Spasso entered the service of his Majesty, King Angus. He is Chief of Police at Glaspyth, now, and nobody can call what he's doing there chicken-stealing, either. Any chickens he steals, he steals the whole farm to get them."

That didn't sound good. Spasso could make King Angus' name stink all over Glaspyth. Or maybe he'd allow Spasso to crush the adherents of Omfray, and then hang him for his oppression of the people. He'd read about somebody who'd done something like that, in one of Harkaman's Old Terran history books.

Baron Rathmore had stayed on Gram; so had Rolve Hemmerding. The rest of the gentlemen-adventurers, all with shiny new titles of nobility, had returned. From them, as the two ships were getting into orbit, he learned what had happened on Gram since the *Nemesis* had spaced out.

Duke Angus had announced his intention of carrying on with the

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Tanith Adventure, and had started construction of a new ship at the Gorram yards. This had served plausibly to explain all the activities of preparation for the invasion of Glaspyth, and had deceived Duke Omfray completely. Omfray had already started a ship of his own; the entire resources of his duchy were thrown into an effort to get her finished and to space ahead of the one Angus was building. Work was going on frantically on her when the Wardshaven invaders hit Glaspyth; she was now nearing completion as a unit of the Royal Navy. Duke Omfray had managed to escape to Didreksburg; when Angus' troops moved in on the latter duchy, he had escaped again, this time off-planet. He was now eating the bitter bread of exile at the court of his wife's uncle, the King of Heulteclere.

The Count of Newhaven, the Duke of Bigglersport, and the Lord of Northport, all of whom had favored the establishment of a planetary monarchy, had immediately acknowledged Angus as their sovereign. So, with a knife at his throat, had the Duke of Didreksburg. Many other feudal magnates had refused to surrender their sovereignty. That might mean fighting, but Paytrik, now Baron, Morland, doubted it.

"The *Space Scourge* stopped that," he said. "When they heard about the base here, and saw what we'd shipped to Gram, they started changing their minds. Only subjects of King Angus will be allowed to invest in the Tanith Adventure.

As for accepting King Angus' annexation of Tanith and accepting his sovereignty, that would also be advisable. They would need a Sword World outlet for the loot they took or obtained by barter from other Space Vikings, and until they had adequate industries of their own, they would be dependent on Gram for many things which could not be gotten by raiding.

"I suppose the King knows I'm not out here for my health, or his profit?" he asked Lord Valpry, during one of the screen conversations as the *Space Scourge* was getting into orbit. "My business out here is Andray Dunnan."

"Oh, yes," the Wardshaven noble replied. "In fact, he told me, in so many words, that he would be most happy if you sent him his nephew's head in a block of lucite. What Dunnan did touched his honor, too. Sovereign princes never see any humor in things like that."

"I suppose he knows that sooner or later Dunnan will try to attack Tanith?"

"If he doesn't, it isn't because I didn't tell him often enough. When you see the defense armament we're bringing, you'll think he does."

It was impressive, but nothing to the engineering and industrial equipment. Mining robots for use on the iron Moon of Tanith, and normal-space transports for the fifty thousand mile run between planet and satellite. A collapsed-matter producer; now they could collapsium-plate their own shielding. A small, fully

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robotic, steel mill that could be set up and operated on the satellite. Industrial robots, and machinery to make machinery. And, best of all, two hundred engineers and highly skilled technicians.

Quite a few industrial baronies on Gram would realize, before long, what they had lost in those men. He wondered what Lord Trask of Traskon would have thought about that.

The Prince of Tanith was no longer interested in what happened to Gram. Maybe, if things prospered for the next century or so, his successors would be ruling Gram by viceroy from Tanith.

XV

As soon as the *Space Scourge* was unloaded, she was put on off-planet watch; Harkaman immediately spaced out in the *Nemesis,* while Trask remained behind. They began unloading the *Rozinante,* after setting her down at Rivington Spaceport. After that was done, her officers and crew took a holiday which lasted a month, until the *Nemesis* returned. Harkaman must have made quick raids on half a dozen planets. None of the cargo he brought back was spectacularly valuable, and he dismissed the whole thing as chicken-stealing, but he had lost some men and the ship showed a few fresh scars. A good deal of what was transshipped to the *Rozinante* was manufactured goods which would compete with merchandise produced on Gram.

"That load will be a come-down, after what the *Space Scourge* took back, but we didn't want to send the *Rozinante* back empty," he said. "One thing, I had time to do a little reading, between stops."

"The books from the Eglonsby library?"

"Yes. I learned a curious thing about Amaterasu. Do you know why that planet was so extensively colonized by the Federation, when there don't seem to be any fissionable ores? The planet produced gadolinium."

Gadolinium was essential to hyperdrive engines; the engines of a ship the size of the *Nemesis* required fifty pounds of it. On the Sword-Worlds, it was worth several times its weight in gold. If they still mined it, Amaterasu would repay a second visit.

When he mentioned it, Harkaman shrugged. "Why should they mine it? There's only one thing it's good for, and you can't run a spaceship on Diesel oil. I suppose the mines could be reopened, and new refineries built, but . . ."

"We could trade plutonium for gadolinium. They have none of their own. We could charge our own prices for it, and we wouldn't need to tell them what gadolinium sells for on the Sword-Worlds."

"We could, if we could do business with anybody there, after what we did to Eglonsby and Stolgoland. Where would we get plutonium?"

"Why do you think the Beowulfers don't have hyperships, when they have everything else?"

Harkaman snapped his fingers.

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"By Satan, that's it!" Then he looked at Trask in alarm. "Hey, you're not thinking of selling Amaterasu plutonium and Beowulf gadolinium, are you?"

"Why not? We could make a big profit on both ends of the deal."

"You know what would happen next, don't you? There'd be ships from both planets all over the place in a few years. We want that like we want a hole in the head."

He couldn't see the objection. Tanith and Amaterasu and Beowulf could work up a very good triangular trade; all three would profit. It wouldn't cost men and ship-damage and ammunition, either. Maybe a mutual defense alliance, too. Think about it later; there was too much to do here on Tanith at present.

There had been mines on the Moon of Tanith before the collapse of the Federation; they had been stripped of their equipment afterward, while Tanith was still fighting a rearguard battle against barbarism, but the underground chambers and man-made caverns could still be used, and in time the mines were reopened and the steel mill put in, and eventually ingots of finished steel were coming down by shuttle-craft. In the meantime, the shipyard had been laid out and was taking shape.

The Gram ship *Queen Flavia*—she had been the one found unfinished at Glaspyth—came in three months after the *Rozinante* started back; she must have been finished while Valkanhayn was still in hyperspace. She carried considerable cargo, some of it superfluous but all of it useful; everybody was investing in the Tanith Adventure now, and the money had to be spent for something. Better, she brought close to a thousand men and women; the leakage of brains and ability from the Sword-Worlds was turning into a flood. Among them was Basil Gorram. Trask remembered him as an insufferable young twerp, but he seemed to be a good shipyard man. He very frankly predicted that in a few years his father's yards at Wardshaven would be idle and all the Tanith ships would be Tanith-built. A junior partner of Lothar Ffayle's also came out, to establish a branch of the Bank of Wardshaven at Rivington.

As soon as the *Queen Flavia* had discharged her cargo and passengers, she took on five hundred ground-fighters from the *Lamia, Nemesis* and *Space Scourge* companies and spaced out on a raiding voyage. While she was gone, the second ship, the one Duke Angus had started at Wardshaven and King Angus had finished, the *Black Star,* came in.

Trask was slightly incredulous at realizing that she had spaced out from Gram almost exactly two years after the *Nemesis* had departed. He still hadn't any idea where Andray Dunnan was, or what he was doing, or how to find him.

The news of the Gram base on Tanith spread slowly, first by the scheduled liners and tramp freighters that linked the Sword-Worlds, and then by trading ships and outbound Space Vikings to the Old Federation.

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Two years and six months after the *Nemesis* had come out of hyperspace to find Boake Valkanhayn and Garvan Spasso on Tanith, the first independent Space Viking came in, to sell a cargo and get repairs. They bought his loot—he had been raiding some planet rather above the level of Khepera and below that of Amaterasu—and healed the wounds his ship had taken getting it. He had been dealing with the Everrard family on Hoth, and professed himself much more satisfied with the bargains he had gotten on Tanith and swore to return.

He had never even heard of Andray Dunnan or the *Enterprise*.

It was a Gilgamesher that brought the first news.

He had first heard of Gilgameshers —the word was used indiscriminately for a native of or a ship from Gilgamesh—on Gram, from Harkaman and Karffard and Vann Larch and the others. Since coming to Tanith, he had heard about them from every Space Viking, never in complimentary and rarely in printable terms.

Gilgamesh was rated, with reservations, as a civilized planet though not on a level with Odin or Isis or Baldur or Marduk or Aton or any of the other worlds which had maintained the culture of the Terran Federation uninterruptedly. Perhaps Gilgamesh deserved more credit; its people had undergone two centuries of darkness and pulled themselves out of it by their bootstraps. They had recovered all the old techniques, up to and including the hyperdrive.

They didn't raid; they traded. They had religious objections to violence, though they kept these within sensible limits, and were able and willing to fight with fanatical ferocity in defense of their home planet. About a century before, there had been a five-ship Viking raid on Gilgamesh; one ship had returned and had been sold for scrap after reaching a friendly base. Their ships went everywhere to trade, and wherever they traded a few of them usually settled, and where they settled they made money, sending most of it home. Their society seemed to be a loose theo-socialism, and their religion an absurd potpourri of most of the major monotheisms of the Federation period, plus doctrinal and ritualistic innovations of their own. Aside from their propensity for sharp trading, their bigoted refusal to regard anybody not of their creed as more than half human, and the maze of dietary and other taboos in which they hid from social contact with others, made them generally disliked.

After their ship had gotten into orbit, three of them came down to do business. The captain and his exec wore long coats, almost knee-length, buttoned to the throat, and small white caps like forage caps; the third, one of their priests, wore a robe with a cowl, and the symbol of their religion, a blue triangle in a white circle, on his breast. They all wore beards that hung down from their cheeks, with their chins and upper lips shaved. They all had the same righteous, disapproving faces,

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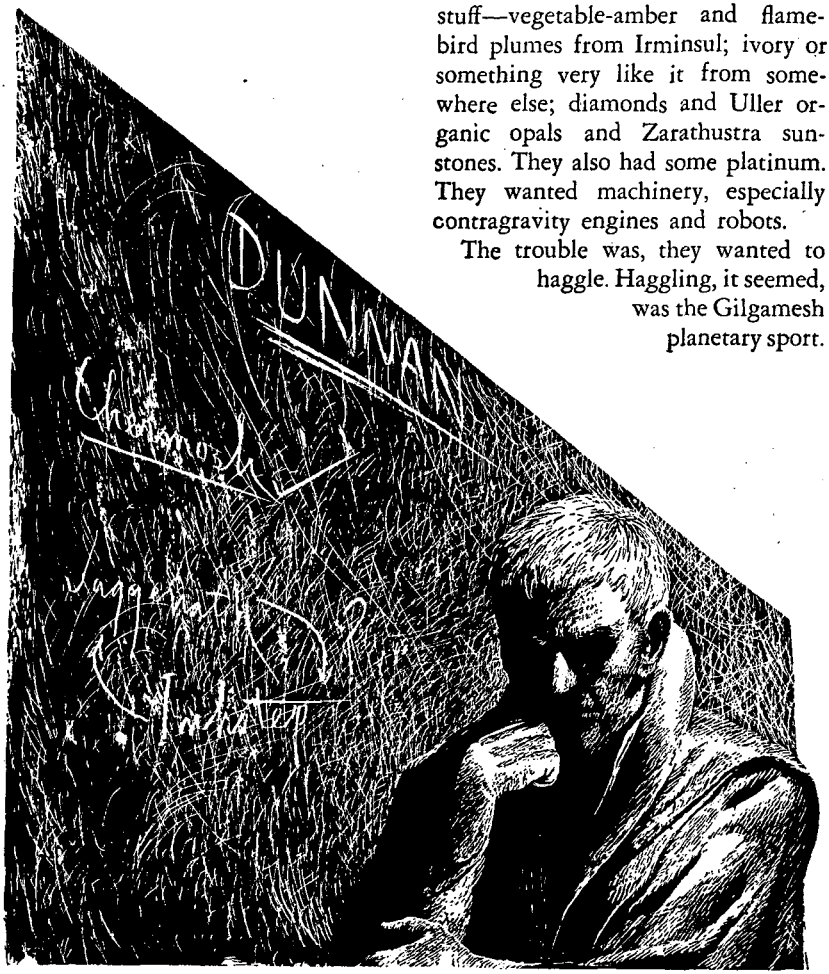
they all refused refreshments of any sort, and they sat uneasily as though fearing contamination from the heathens who had sat in their chairs before them. They had a mixed cargo of general merchandise picked up here and there on subcivilized planets, in which nobody on Tanith was interested. They also had some good stuff—vegetable-amber and flamebird plumes from Irminsul; ivory or something very like it from somewhere else; diamonds and Uller organic opals and Zarathustra sunstones. They also had some platinum. They wanted machinery, especially contragravity engines and robots.

The trouble was, they wanted to haggle. Haggling, it seemed, was the Gilgamesh planetary sport.



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"Have you ever heard of a Space Viking ship named the *Enterprise?*" he asked them, at the seventh or eighth impasse in the bargaining. "She bears a crescent, light blue on black. Her captain's name is Andray Dunnan."

"A ship so named, with such a device, raided Chermosh more than a year ago," the priest-supercargo said. "Some of our people tarry on Chermosh to trade. This ship sacked the city in which they were; some of them lost heavily in world's goods."

"That's a pity."

The Gilgamesh priest shrugged. "It is as Yah the Almighty wills," he said, then brightened slightly. "The Chermoshers are heathens and worshipers of false gods. The Space Vikings looted their temple and destroyed it utterly; they carried away the graven images and abominations. Our people bore witness that there was much wailing and lamentation among the idolators."

So that was the first entry on the Big Board. It covered, optimistically, the whole of one wall in his office, and for some time that one chalked note about the raid on Chermosh, and the date, as nearly as it could be approximated, looked very lonely on it. The captain of the *Black Star* brought back material for a couple more. He had put in on several planets known to be temporarily occupied by Space Vikings, to barter loot, give his men some time off-ship, and make inquiries, and he had names for a couple of planets raided by the blue crescent ship. One was only six months old.

The way news filtered about in the Old Federation, that was practically hot off the stove.

The owner-captain of the *Alborak* had something to add, when he brought his ship in six months later. He sipped his drink slowly, as though he had limited himself to one and wanted to make it last as long as possible.

"Almost two years ago, on Jagannath," he said. "The *Enterprise* was on orbit there, getting some light repairs. I met the man a few times. Looks just like those pictures, but he's wearing a small pointed beard, now. He'd sold a lot of loot. General merchandise, precious and semiprecious stones, a lot of carved and inlaid furniture that looked as though it had come from some Neobarb king's palace, and some temple stuff. Buddhist; there were a couple of big gold Dai-Butsus. His crew were standing drinks for all comers. Some of them were pretty dark above the collar, as though they'd been on a hot-star planet not too long before. And he had a lot of Imhotep furs to sell, simply fabulous stuff."

"What kind of repairs? Combat damage?"

"That was my impression. He spaced out a little over a hundred hours after I came in, in company with another ship. The *Starhopper*, Captain Teodor Vaghn. The talk was that they were making a two-ship raid somewhere." The captain of the *Alborak* thought for a moment. "One

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other thing. He was buying ammunition, everything from pistol cartridges to hellburners. And he was buying all the air-and-water recycling equipment, and all the carniculture and hydroponic equipment, he could get."

That was something to know. He thanked the Space Viking, and then asked:

"Did he know, at the time, that I'm out here hunting for him?"

"If he did, nobody else on Jagannath did. I didn't hear about it, myself, till six months afterward."

That evening, he played off the recording he had made of the conversation for Harkaman and Valkanhayn and Karffard and some of the others. Somebody instantly said:

"That temple stuff came from Chermosh. They're Buddhists, there. That checks with the Gilgamesher's story."

"He got the furs on Imhotep; he traded for them," Harkaman said. "Nobody gets anything off Imhotep by raiding. The planet's in the middle of a glaciation, the land surface down to the fiftieth parallel is iced over solid. There is one city, ten or fifteen thousand, and the rest of the population is scattered around in settlements of a couple of hundred all along the face of the glaciers. They're all hunters and trappers. They have some contragravity, and when a ship comes in, they spread the news by radio and everybody brings his furs to town. They use telescope sights, and everybody over ten years old can hit a man in the head at five hundred yards. And big weapons are no good; they're too well dispersed. So the only way to get anything out of them is to trade for it."

"I think I know where he was," Alvyn Karffard said. "On Imhotep, silver is a monetary metal. On Agni, they use silver for sewer-pipe. Agni is a hot-star planet, class B-3 sun. And on Agni they are tough, and they have good weapons. That could be where the *Enterprise* took that combat damage."

That started an argument as to whether he'd gone to Chermosh first. It was sure that he had gone to Agni and then Imhotep. Guatt Kirbey tried to figure both courses.

"It doesn't tell us anything, either way, he said at length. "Chermosh is away off to the side from Agni and Imhotep in either case."

"Well, he does have a base, somewhere, and it's not on any Terra-type planet," Valkanhayn said. "Otherwise, what would he want with all that air-and-water and hydroponic and carniculture stuff?"

The Old Federation area was full of non-Terra-type planets, and why should anybody bother going to any of them? Any planet that wasn't oxygen-atmosphere, six to eight thousand miles in diameter, and within a narrow surface-temperature range, wasn't worth wasting time on. But a planet like that, if one had the survival equipment, would make a wonderful hideout.

"What sort of a captain is this Teodor Vaghn?" he asked.

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"A good one," Harkaman said promptly. "He has a nasty streak—sadistic—but he knows his business and he has a good ship and a well-trained crew. You think he and Dunnan have teamed up?"

"Don't you? I think, now that he has a base, Dunnan is getting a fleet together."

"He'll know we're after him by now," Vann Larch said. "And he knows where we are, and that puts him one up on us."

XVI

So Andray Dunnan was haunting him again. Tiny bits of information came in—Dunnan's ship had been on Hoth, on Nergal, selling loot. Now he sold for gold or platinum, and bought little, usually arms and ammunition. Apparently his base, wherever it was, was fully self-sufficient. It was certain, too, that Dunnan knew he was being hunted. One Space Viking who had talked with him quoted him as saying: "I don't want any trouble with Trask, and if he's smart he won't look for any with me." This made him all the more positive that somewhere Dunnan was building strength for an attack on Tanith. He made it a rule that there should always be at least two ships in orbit off Tanith in addition to the *Lamia,* which was on permanent patrol, and he installed more missile-launching stations both on the moon and on the planet.

There were three ships bearing the Ward swords and atom-symbol, and a fourth building on Gram. Count Lionel of Newhaven was building one of his own, and three big freighters shuttled across the three thousand light-years between Tanith and Gram. Sesar Karvall, who had never recovered from his wounds, had died; Lady Lavina had turned the barony and the business over to her brother, Burt Sandrasan, and gone to live on Excalibur. The shipyard at Rivington was finished, and now they had built the landing-legs of Harkaman's *Corisande II,* and were putting up the skeleton.

And they were trading with Amaterasu, now. Pedrosan Pedro had been overthrown and put to death by General Dagró Ector during the disorders following the looting of Eglonsby; the troops left behind in Stolgoland had mutinied and made common cause with their late enemies. The two nations were in an uneasy alliance, with several other nations combining against them, when the *Nemesis* and the *Space Scourge* returned and declared peace against the whole planet. There was no fighting; everybody knew what had happened to Stolgoland and Eglonsby. In the end, all the governments of Amaterasu joined in a loose agreement to get the mines reopened and resume production of gadolinium, and to share in the fissionables being imported in exchange.

It had been harder, and had taken a year longer, to do business with Beowulf. The Beowulfers had a single planetary government, and they were inclined to shoot first and nego-

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tiate afterward, a natural enough attitude in view of experiences of the past. However, they had enough old Federation-period textbooks still in microprint to know what could be done with gadolinium. They decided to write off the past as fair fight and no bad blood, and start over again.

It would be some years before either planet had hyperships of their own. In the meantime, both were good customers, and rapidly becoming good friends. A number of young Amaterasuans and Beowulfers had come to Tanith to study various technologies.

The Tanith locals were studying, too. In the first year, Trask had gathered the more intelligent boys of ten to twelve from each community and begun teaching them. In the past year, he had sent the most intelligent of them off to Gram to school. In another five years, they'd be coming home to teach; in the meantime, he was bringing teachers to Tanith from Gram. There was a school at Tradetown, and others in some of the larger villages, and at Rivington there was something that could almost be called a college. In another ten years or so, Tanith would be able to pretend to the status of civilization.

If only Andray Dunnan and his ships didn't come too soon. They would be beaten off, he was confident of that; but the damage Tanith would take, in the defense, would set back his work for years. He knew all too well what Space Viking ships could do to a planet. He'd have to find Dunnan's base, smash it, destroy his ships, kill the man himself, first. Not to avenge that murder six years ago on Gram; that was long ago and far away, and Elaine was vanished, and so was the Lucas Trask who had loved and lost her. What mattered now was planting and nurturing civilization on Tanith.

But where would he find Dunnan, in two hundred billion cubic light-years? Dunnan had no such problem. He knew where his enemy was.

And Dunnan was gathering strength. The *Yo-Yo,* Captain Vann Humfort; she had been reported twice, once in company with the *Starhopper,* and once with the *Enterprise.* She bore a blazon of a feminine hand dangling a planet by a string from one finger; a good ship, and an able, ruthless captain. The *Bolide;* she and the *Enterprise* had made a raid on Ithunn. The Gilgameshers had settled there and one of their ships had brought that story in.

And he recruited two ships at once on Melkarth, and there was a good deal of mirth about that among the Tanith Space Vikings.

Melkarth was strictly a poultry planet. Its people had sunk to the village-peasant level; they had no wealth worth taking or carrying away. It was, however, a place where a ship could be set down, and there were women, and the locals had not lost the art of distillation, and made potent liquors. A crew could have fun there, much less expensively than on a regular Viking base planet,

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and for the last eight years a Captain Nial Burrik, of the *Fortuna,* had been occupying it, taking his ship out for occasional quick raids and spending most of the time living from day to day almost on the local level. Once in a while, a Gilgamesher would come in to see if he had anything to trade. It was a Gilgamesher who brought the story to Tanith, and it was almost two years old when he told it.

"We heard it from the people of the planet, the ones who live where Burrik had his base. First, there was a trading ship came in. You may have heard of her; she is the one called the *Honest Horris.*"

Trask laughed at that. Her captain, Horris Sasstroff, called himself "Honest Horris," a misnomer which he had also bestowed on his ship. He was a trader of sorts. Even the Gilgameshers despised him, and not even a Gilgamesher would have taken a wretched craft like the *Honest Horris* to space.

"He had been to Melkarth before," the Gilgamesher said. "He and Burrik are friends." He pronounced that like a final and damning judgment of both of them. "The story the locals told our brethren of the *Fairdealer* was that the *Honest Horris* was landed beside Burrik's ship for ten days, when two other ships came in. They said one had the blue crescent badge, and the other bore a green monster leaping from one star to another."

The *Enterprise* and the *Starhopper.* He wondered why they'd gone to a planet like Melkarth. Maybe they knew in advance whom they'd find there.

"The locals thought there would be fighting, but there was not. There was a great feast, of all four crews. Then everything of value was loaded aboard the *Fortuna,* and all four ships lifted and spaced out together. They said Burrik left nothing of any worth whatever behind; they were much disappointed at that."

"Have any of them been back since?"

All three Gilgameshers, captain, exec, and priest, shook their heads.

"Captain Gurrash of the *Fairdealer* said it had been over a year before his ship put in there. He could still see where the landing legs of the ships had pressed into the ground, but the locals said they had not been back."

That made two more ships about which inquiries must be made. He wondered, for a moment, why in Gehenna Dunnan would want ships like that; they must make the *Space Scourge* and the *Lamia* as he had first seen them look like units of the Royal Navy of Excalibur. Then he became frightened, with an irrational retrospective fright at what might have happened. It could have, too, at any time in the last year and a half; either or both of those ships could have come in on Tanith completely unsuspected. It was only by the sheerest accident that he had found out, even now, about them.

Everybody else thought it was a huge joke. They thought it would be a bigger joke if Dunnan sent those

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ships to Tanith now, when they were warned and ready for them.

There were other things to worry about. One was the altering attitude of his Majesty Angus I. When the *Space Scourge* returned, the newly-titled Baron Valkanhayn brought with him, along with the princely title and the commission as Viceroy of Tanith, a most cordial personal audiovisual greeting, warm and friendly. Angus had made it seated at his desk, bare headed and smoking a cigarette. The one which had come on the next ship out was just as cordial, but the King was not smoking and wore a small gold-circled cap-of-maintenance. By the time they had three ships in service on scheduled three-month arrivals, a year and a half later, he was speaking from his throne, wearing his crown and employing the first person plural for himself and finally the third person singular for Trask. By the end of the fourth year, there was no audiovisual message from him in person, and a stiff complaint from Rovard Grauffis to the effect that His Majesty felt it unseemly for a subject to address his sovereign while seated, even by audiovisual. This was accompanied by a rather apologetic personal message from Grauffis—now Prime Minister—to the effect that His Majesty felt compelled to stand on his royal dignity at all times, and that, after all, there was a difference between the position and dignity of the Duke of Wardshaven and that of the Planetary King of Gram.

Prince Trask of Tanith couldn't quite see it. The King was simply the first nobleman of the planet. Even kings like Rodolf of Excalibur or Napolyon of Flamberge didn't try to be anything more. Thereafter, he addressed his greetings and reports to the Prime Minister, always with a personal message, to which Grauffis replied in kind.

Not only the form but also the content of the messages from Gram underwent change. His Majesty was most dissatisfied. His Majesty was deeply disappointed. His Majesty felt that His Majesty's colonial realm of Tanith was not contributing sufficiently to the Royal Exchequer. And his Majesty felt that Prince Trask was placing entirely too much emphasis upon trade and not enough upon raiding; after all, why barter with barbarians when it was possible to take what you wanted from them by force?

And there was the matter of the *Blue Comet,* Count Lionel of Newhaven's ship. His Majesty was most displeased that the Count of Newhaven was trading with Tanith from his own spaceport. All goods from Tanith should pass through the Wardshaven spaceport.

"Look, Rovard," he told the audiovisual camera which was recording his reply to Grauffis. "You saw the *Space Scourge* when she came in, didn't you? That's what happens to a ship that raids a planet where there's anything worth taking. Beowulf is lousy with fissionables; they'll give us all the plutonium we can load, in exchange for gadolinium, which we sell

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them at about twice Sword-World prices. We trade plutonium on Amaterasu for gadolinium, and get it for about half Sword-World prices." He pressed the stop-button, until he could remember the ancient formula. "You may quote me as saying that whoever has advised His Majesty that that isn't good business is no friend to His Majesty or to the Realm.

"As for the complaint about the *Blue Comet;* as long as she is owned and operated by the Count of Newhaven, who is a stockholder in the Tanith Adventure, she has every right to trade here."

He wondered why His Majesty didn't stop Lionel of Newhaven from sending the *Blue Comet* out from Gram. He found out from her skipper, the next time she came in.

"He doesn't dare, that's why. He's King as long as the great lords like Count Lionel and Joris of Bigglersport and Alan of Northport want him to be. Count Lionel has more men and more guns and contragravity than he has, now, and that's without the help he'd get from everybody else. Everything's quiet on Gram now, even the war on Southmain Continent's stopped. Everybody wants to keep it that way. Even King Angus isn't crazy enough to do anything to start a war. Not yet, anyhow."

"Not *yet?*"

The captain of the *Blue Comet,* who was one of Count Lionel's vassal barons, was silent for a moment.

"You ought to know, Prince Trask," he said. "Andray Dunnan's grandmother was the King's mother. Her father was old Baron Zarvas of Blackcliffe. He was what was called an invalid, the last twenty years of his life. He was always attended by two male nurses about the size of Otto Harkaman. He was also said to be slightly eccentric."

The unfortunate grandfather of Duke Angus had always been a subject nice people avoided. The unfortunate grandfather of King Angus was probably a subject everybody who valued their necks avoided.

Lothar Ffayle had also come out on the *Blue Comet.* He was just as outspoken.

"I'm not going back. I'm transferring most of the funds of the Bank of Wardshaven out here; from now on, it'll be a branch of the Bank of Tanith. This is where the business is being done. It's getting impossible to do business at all in Wardshaven. What little business there is to do."

"Just what's been happening?"

"Well, taxation, first. It seems the more money came in from here, the higher taxes got on Gram. Discriminatory taxes, too; pinched the small landholding and industrial barons and favored a few big ones. Baron Spasso and his crowd."

"Baron Spasso, now?'

Ffayle nodded. "Of about half of Glaspyth. A lot of the Glaspyth barons lost their baronies—some of them their heads—after Duke Omfray was run out. It seems there was a plot against the life of His Majesty.

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It was exposed by the zeal and vigilance of Sir Garvan Spasso, who was elevated to the peerage and rewarded with the lands of the conspirators."

"You said business was bad, as business?"

Ffayle nodded again. "The big Tanith boom has busted. It got oversold; everybody wanted in on it. And they should never have built those two last ships, the *Speedwell* and the *Goodhope;* the return on them didn't justify it. Then, you're creating your own industries and building your own equipment and armament here; that's caused a slump in industry on Gram. I'm glad Lavina Karvall has enough money invested to live on. And finally, the consumers' goods market is getting flooded with stuff that's coming in from here and competing with Gram industry."

Well, that was understandable. One of the ships that made the shuttle-trip to Gram would carry enough in her strong rooms, in gold and jewels and the like, to pay a handsome profit on the voyage. The bulk-goods that went into the cargo holds was practically taking a free ride, so anything on hand, stuff that nobody would ordinarily think of shipping in interstellar trade, went aboard. A two thousand foot freighter had a great deal of cargo space.

Baron Trask of Traskon hadn't even begun to realize what Tanith base was going to cost Gram.

To be continued

Statement required by the Act of August 24, 1912, as amended by the Acts of March 3, 1933, July 2, 1946, and June 11, 1960 (74 Stat. 208) showing the ownership, management, and circulation of ANALOG Science Fact ⚓ Science Fiction published monthly, at Greenwich, Conn., for October 1, 1962

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5. The average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the 12 months preceding the date shown above was: 77,206

ROBERT E. PARK, Business Manager.

(SEAL)

Sworn to and subscribed before me this 24th day of September, 1962. Betty M. Thompson, Notary Public, No. 3968875. (My commission expires March 30, 1963.)

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Crucial Experiment III

by Joseph Goodavage

ASTRO FORECAST
DECEMBER

On the night of December 2nd, a drastic drop in temperatures will preview the dominating winter pattern. By this time, orthodox forecasters will be predicting a cold winter for the United States.

A pattern of heavy snowfall over the Cascade Mountains and the northern Rockies will be set during December, with excessive moisture and chronic cloudiness dominating the northern Pacific coast.

A complex weather pattern in this area indicates freezes, thaws, and mixtures of rain along the coast. Snow slides, caused by rising temperatures and sporadic mild spells in the mountains, will be a danger around the 4th and 5th of December.

But moderate temperatures extending southward until the 10th of the month will result from predominating, northing low pressure areas.

The heaviest snowfall of the month, caused by a southing major low, centering over California into Arizona on December 11th will spill masses of snow over the Sierra Nevada Mountains. At the same time, polar air masses traveling eastward over northern regions will intensify. This depression will move eastward through the lower Mississippi Valley, breeding snow for the Atlantic coast over the 12th and 13th; the cold wave will intensify over midwestern states.

This storm will develop into a "nor'easter" on the Atlantic coast; extra heavy precipitation will develop on the night of December 13th and last through the 14th. In the wake of this storm, the cold front will become more intense.

Although these northeasters coinciding with cold waves in the interior are classic patterns for snowfall over coastal inlands, they sometimes upset forecasts north of Chesapeake Bay. If the inland polar air mass with clockwise air flows is deep enough, this storm will be driven out to sea before it reaches New York. But this mass of frigid air will intensify over

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all elevations, especially east of the Appalachians.

The third and last of a series of magnetic perturbations in the upper reaches of the atmosphere will be evident this month, most likely in the far Northwest. Although these phenomena will be moderate, we can expect erratic, localized wind velocity to accompany this phenomenon in northern latitudes and higher elevations. Potential "trigger" dates: December 7th, 10th, 11th, 14th and 17th.

More heavy snows will be shunted off the Rockies southward, accompanied by a persistent low temperature trend over the northern border states from the Dakotas to Maine. The third week in December, however, will bring a milder trend of average temperatures to the north Atlantic coastal areas.

Officially, winter begins on December 22nd at 3:15 a.m., E.S.T. On December 25th-26th, a low pressure area growing from the northern Pacific coast will drift eastward and focus over the northern central states on December 27th and 28th. Bitterly cold temperatures, skidding downslope and eastward, will become even more intense *east* of Chicago. Note that this will set the pattern for a *Saturnine* winter.

Years of observation have shown that when up to seventy per cent of the celestial bodies are in south declination—that is, when south of the equator during winter months, the winters are most severe in the Northern Hemisphere. Conversely, the summers in the Southern Hemisphere are then intensely hot. Although this trend has been existing for several years and is approaching a peak, other astronomical factors are also related to regional abnomalies of severe cold. One of these predicted last winter's intense cold spawning from Alaska.

Unusual weather patterns for the same season shift some distance westward each year—the result being that a severely cold winter in one region is followed the next year by a relatively mild season in the north—and cold in the south. This is due to reversed patterns which may include the frequency of *southing* highs, thus accounting for the fact that Florida sometimes reports colder winter temperatures than New York City.

Because many astro-meteorological charts must be calculated, beginning with the Earth's entry into the winter solstice, with the Sun in the Sign of Capricorn, the January installment of this experiment will attempt to point out with great precision and accuracy of the regions of coldest weather this winter and to interpret the exact dates of lowest temperatures.

* * *

RANDOM FORECAST DECEMBER

December's purely random forecast, obtained by using the "wheel of fortune" method, is presented again for the purpose of comparison with the astro-meteorological forecast.

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The spinner indicates Texas, Mexico and Arizona as being hot and dry during the first week of December; possible drought here. Beginning on December 6th, there will be extreme high tides and strong wind velocities on the coast of California from north of San Francisco to San Diego.

Extremely high velocity winds and rain will lash the Georgia, Louisiana, Florida area beginning December 9th and lasting to about midnight of the 13th. From the 17th to the 26th, the Gulf states will be saturated in an incessant, fine freezing drizzle that will snarl traffic and result in many highway accidents due to glazed roads.

Chicago, St. Louis and adjacent areas will be subjected to an intense, cold dry period from the night of the 15th until December 19th. Beginning at about the same time, powerful wind velocities, coming down from Alaska, will batter Southern California, Arizona, Mexico and New Mexico.

From the Gulf of Mexico, an intense low will spawn a hurricane that will smash northern shore communities on the 21st, then grow proportionately weaker in northern transit until it blows itself out to sea over Maine on the 30th.

Beginning on December 22nd and centering over Pittsburgh, Pennsylvania, a mild, warm spell will prevail, spreading northward until it reaches the Canadian border states on December 31st. ◘

The Analytical Laboratory

AUGUST 1962

PLACE	TITLE	AUTHOR	POINTS
1.	The Toughest Opponent	*Christopher Anvil*	1.65
2.	Border, Breed Nor Birth (Pt. 2)	*Mack Reynolds*	2.27
3.	The Bramble Bush	*Randall Garrett*	2.82
4.	Watch the Sky	*James H. Schmitz*	3.20

SEPTEMBER 1962

1.	A Life for the Stars (Pt. 1)	*James Blish*	1.79
2.	The Winds of Time	*James H. Schmitz*	3.03
3.	The Professional Approach	*Leonard Lockhart*	3.16
4.	Sorcerer's Apprentice	*Christopher Anvil*	3.46
5.	Good Indian	*Mack Reynolds*	4.37

THE EDITOR

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the Reference Library

P. Schuyler Miller

The People's Science FICTION

■ Not so many years ago, American newspapers would gleefully report that one or another Soviet official or spokesman had taken time to deliver a diatribe against science fiction. Never, never, never, the world was told, could such imperialist, non-dialectical trash arise in the People's World.

The era of the Sputnik and the Vostoks seems to have changed the Party line on science fiction. Not only does Russia admit that it exists—and apparently has existed for years—behind the Iron Curtain; the Foreign Languages Publishing House has been busily churning out Englished editions of books that are fit to meet the foreign eye. Two of these have recently been brought out in American paperback editions by Collier Books, that most amazingly ambitious of pb houses, and some of the others are advertised by importers of Soviet literature such as Cross World Books of 333 S. Wacker Drive, Chicago 6, Illinois.

The Collier editions, published as "Soviet Science Fiction" and "More Soviet Science Fiction"—Collier Nos. AS-279V and AS-295V, respectively—are short-story collections taken directly from the FLPH English editions and embellished by introductions by Isaac Asimov. As the Good Doctor points out, these are stories selected on criteria unknown to us as typical of what the Russians want us to accept as Soviet science fiction. Addition of a clutch of novels does not materially change this picture.

A couple of generalities can, however, be added. With one exception—Yefremov's long novel "Andromeda"—the stories in these two collections are the only examples of *recent* science fiction by currently active writers. Most of the newly published novels date from the 1920s when the Soviet image had scarcely taken shape. Second, as Dr. Asimov points out, they are very old-fashioned by American and English standards. Whether they are also old-fashioned in style

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by American standards, or whether this is the effect of poor translation, I can't say. Any really valid comments on Soviet science fiction must wait until someone can both find it and read it in the original Russian.

The Russian paperbacks which Collier has reprinted, with the omission of some footnotes, are "A Visitor From Outer Space" and "The Heart of the Serpent." Cross Worlds prices were $1.25 apiece; Collier charges 95 cents on your newsstand. In his introductions to the American editions, Dr. Asimov sets up an evolutionary structure for American SF into which he then fits the Russian stories. I trust that repeating it and using it here to discuss these and other books won't prevent your reading the full original.

The earliest stage of science fiction as we in the United States know it was that of the strange adventure story—Verne's "extraordinary travels," in the course of which the characters visit very strange places, encounter and/or combat strange creatures, and come to grips with even stranger people. Later, especially with the maturing of this magazine, came an era in which technology was dominant and a good new gadget could always sell a story. Now we are in a period where sociological themes are dominant. To condense the argument, the examples of Soviet science fiction in these collections almost all fall into the first two stages. With exceptions to be noted a little later, Soviet writers have steered clear of social commentary—but there are and have been exceptions.

Adding the books that Cross World has in stock—and I have read only one other—leaves the Asimovian analysis pretty well intact. I want to amplify his structure, however, in a couple of respects with which I feel sure he will have no quarrel. First, although these three stages represent trends, good stories of any type can be written at any time. Second, good writers—especially in science fiction—are apt to be ahead of their time.

The first-written books on the Cross World list date from the 1920s and are not very different from the science fiction that Americans were turning out at the same time. A good share of it, to judge from the jacket comments as well as the book on hand, was intended for young people.

Valdimir Obruchev, whose "Plutonia" came out in an American edition last year, is represented in the new lot by a second adventure story, "Sannikov Land." Cross World prices,

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$1.25 and $1.20 for the FLPH hardbound English editions. Obruchev shapes up as a Russian counterpart of our A. Hyatt Verrill. An explorer and paleontologist who died in 1956 at the age of ninety-three, his stories also told in rather simple fashion of the strange experiences of Russian explorers beyond the fringes of the known world—even more possible in Russia of 1924 and 1926 than, say, in the South America of Verrill or A. Merritt. "Plutonia," you'll recall, was a simple, lively story about a world inside the Earth, like Burroughs' Pellucidar, where the explorers found flora and fauna extending back to the era of dinosaurs, including huge intelligent ants. "Sannikov Land" is simpler and based more directly on actuality—early reports of a continent or large island north of Siberia, to which an early tribe may have fled. In the story, it turns out to be a crater island where mammoths and other Pleistocene animals have survived, and where both the lost Onlikons and a colony of Neanderthal men have taken refuge. In a postscript dated 1955, for this edition, the author points out that the ice islands discovered in our own time probably gave rise to the story of Sannikov Land and that the Onlikons are still a mystery.

These are good, rambling, colorful adventure stories which would have read as well here as in Russia. The author's personal knowledge of the strange lands he is extrapolating a little adds savor, as it did with Verrill's considerably more dated books.

Alexander Belayev's "The Amphibian," from 1928, is a kind of leisurely "Island of Doctor Moreau" with a setting in the Argentine. Here, while the plot is that of adventure and cruel scheming by a nasty capitalist, there is also the technological element of wonder at the weird lifeforms that Dr. Salvator has created in his castle on the cliffs, and especially Ichthyander the "sea devil," a man with gills who can live on land or under the sea. The plot deals with an attempt to capture and exploit him as a pearl diver, and his own highly moral love affair with an Indian girl. As in Anderson's "Little Mermaid," he must pay a penalty, and does. Price, by the way, is $1.00 for a pocket-sized hardback.

The same author has a short story, "Hoity Toity," in the "Soviet Science Fiction" collection. Here the theme is very similar: a human brain is transplanted into an elephant's skull, and the theme is an elephant's-eye view of life in the jungle. Belayev was a lawyer and musician who became a writer and is credited by the "Amphibian" jacket with having written some fifty novels before his death in 1925. From the titles mentioned, he was fond of this future-surgery theme.

A third writer of the same period, Alexei Tolstoi, is represented here by two very different books: "Aelita" from 1922, and "The Garin Death Ray," from 1927. The latter is the more interesting—"Aelita" is a story of a visit to a Burroughs-type Mars on which people are blue rather than red—but both of them have a strong

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sociological element of a kind that Isaac Asimov does not include in his analysis.

In the introduction to "More Soviet Science Fiction," Dr. A. has expanded on his first classification, breaking the sociology-dominant type into three sub-types. These are stories on the "What if—" theme, which constructs a strange society but does not necessarily relate it to our world; the "If only—" stories, proposing utopian societies somewhere in time or space; and the "If this goes on—" stories. The latter are usually stories of social criticism like "1984" or "The Space Merchants," but they can take the "If this goes on—namely communism—there will be pie in the sky" approach. They can also point to the horrors of a world in which capitalism has not yet been killed.

I have heard that Tolstoi was a son of the great Russian novelist; this is not mentioned on the jackets, but he is credited with being an engineer. "Aelita" is a stock interplanetary adventure yarn, complete with survivors of a once-great race—migrants to Mars from Atlantis—a priest-king, his beautiful daughter with whom one of the heroes fall in love, the rise of the downtrodden, and all the rest. In this case, the second hero, a professional soldier who has fought with honor all through the early years of the Bolshevik revolution, carries the revolution to Mars and assumes leadership of the insurrectionists.

I can't decide whether Tolstoi, who was thirty-four when the Soviets took over, was subtly burlesquing this type or not. "Aelita" is $1.25 from Cross World Books.

"The Garin Death Ray"—which Cross World billed as the "Gagarin" death ray at $1.25—is something else again. Here a Soviet intelligence man gets on the track of an inventor who has produced a functioning death ray, and who intends to rule the world. A type, again, but in this case a Russian. He does enlist the support of an American chemical tycoon, but double-crosses him at the first opportunity. Here is fast-moving adventure, some mystery, a fair amount of satirizing of capitalist mores but just as much of the man from whatever society who wants himself on top.

There is now a long jump—in my sample, at least—to our own time and another group of writers, represented in the two short-story collections and in two books by Ivan Yefremov, another paleontologist turned novelist. The short stories published by Hutchinson in England, several years ago, as "A Meeting Over Tuscarora" are pure Stage 1 in the Asimov classification—an old seaman's yarns about a wreck that has drifted for two hundred years, a monstrous worm, and strange people, places and things in the unexplored wilds of High Asia, the Soviet backwoods. He sounds in these stories like Merritt or William Hope Hodgson, or his compatriot Obruchev.

Two of the stories by Alexander Kazantsev in "A Visitor from Outer Space"—alias "Soviet Science Fiction"—are of much the same type.

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The title story, with a gigantic footnote omitted in the Collier edition, proposes that the Siberian meteorite that fell in 1908 was a spaceship; its sequel, "The Martian," purports to be the story of a survivor. To break down the Asimov classification a little farther, these are stories about a technical hypothesis—Stage 2. The collaborating brothers Akady and Boris Strugatsky, respectively a linguist and an astronomer and by far the best writers in the current lot, have a story in each of the collections, both also Stage 2, but representing different subclasses. "Spontaneous Reflex," in "Visitor," is told from the point of view of a too-efficient robot—a technological story about an invention. "Six Matches," in "The Heart of the Serpent," is also technological but deals with the investigation of a phenomen -as it happens, psionic powers. Either would not have been out of place here.

As Dr. Asimov points out, the stories in the second Collier collection are primarily in this technical vein. Anatoly Dnieprov's "Siema" is about a robot that develops a personality. Victor Saparin, in "The Trial of Tantalus," contributes a technical phenomenon story—a mutant virus —plus the interesting concept of a reservation where bacteria and viruses can be protected from extinction. Valentina Zhuravieva—the only woman in the lot—invents a bio-automaton in "Stone from the Stars," a very mild story in all respects.

Back, now, to Yefremov—or Efremov, in some translations. "The Heart of the Serpent" is a direct attack on Murray Leinster's "First Contact," published here and something of a classic by now. Leinster resolved the problem of a first contact with an alien race by having the two exchange ships, so that neither has an advantage and neither can follow the other home. Yefremov builds his "first contact" story on the premises that any really intelligent spacefaring race will be humanoid and communist, since these conditions represent the peak of biological and social evolution. Dialectical argument then requires that there shall be no possibility of conflict in contacts between perfect peoples. The people from oxygen and fluoride worlds can never visit each other, but they can co-exist.

"Andromeda," Yefremov's 445-page novel of the far future—$2.50 from Cross World—is by far the most developed of the lot. This is real modern science fiction, Soviet flavored. It depicts a complex future society that has evolved from that of the present Soviet world, but along the same lines. People work out of their responsibility to their society, not because of the need for labor. They may be in a mine one day and a laboratory the next. Antisocial types are exiled to an island where they degenerate to individualism of the most brutish sort.

Several plots run concurrently and cross-link from time to time. There is an adventure theme in the exploration of a distant planet of a high-

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gravity star, where weird monsters nearly wreck the expedition and where a disk-ship from another civilization is found. There is a technological theme in the testing of a device which will by-pass the relativity limitations and open the far worlds to Man. There are a number of sociological themes: the ethics of testing this invention without official approval, for one. There is also a good amount of moralizing about the sins of imperialists in the grim old past. By our lights, most of the characters are exasperating—but the book was not written by or for our standards or society. Here Yefremov shows the same evolution and ability to handle adventure, technology and sociology in combination that we expect of American SF. If Wyndham or Clarke can write stories of the variety they do, or Poul Anderson, or many another, why not the Russians?

EYE OF THE MONSTER, by Andre Norton

SEA SIEGE, by Andre Norton. Ace Books, N. Y. No. F-147. 80 + 176 pp. 40¢

"Eye of the Monster," the new section of this Ace Double, is hardly more than a novelette; "Sea Siege" is a reprint of the good Harcourt, Brace juvenile of 1957.

"Monster" is representative Norton, but not by any means one of her outstanding stories. Enough ideas are tossed into it, though, to provide meat for a far longer book. There is the concept, first, of a frontier planet with outposts of different galactic races, there for different purposes. There is the concept of galactic missionaries, as sincere and as stubbornly blind to reality as martyrs have always been. There is the sketched in portrait of the cat people, the Salariki, whom Rees Naper rescues after their station, like his, has been overwhelmed by the bloodthirsty "crocs," the intelligent and savage reptilians of Ishkur. There is the theme expressed in the title and never really developed—something unusual for Miss Norton: that to know what a monster will do, one must see with the eye of the monster.

"Sea Siege" proves that this author does not have to use far planets for her settings to write a gripping story. This is laid in the Caribbean, when strange monsters from the bottom of the sea attack a research station and an atomic war simultaneously sweeps over the world. It's every bit as good reading as it was five years ago.

SECRET AGENT OF TERRA, by John Brunner. **THE RIM OF SPACE**, by A. Bertram Chandler. Ace Books, N. Y. No. F-133. 127 + 128 pp. 40¢

If you like adventure on far worlds, this Ace Double is a bargain. The Chandler half is a reprint of the Avalon book of last year, and originally appeared here in Astounding. It is one of the author's "Rim" yarns. The Brunner novel, on the other hand, is a thoroughly enjoy-

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able story of plotting and adventure on a strange world, where descendants of a wrecked ship have produced a tradition-ridden civilization that makes better sense than you'd suppose. Sharpies from a hard-headed world move in to profit from deposits of fissionable elements; agents of the Corps Galactica are there to protect the natives —among them a very determined young woman. And there are the parradiles—gorgeous, multicolored, pterodactyl-like creatures, and just a little bit more.

John Brunner's space-adventure stories get better and better. I hope we have a lot more of them.

THE DAY THE EARTH CAUGHT FIRE, by Barry Wells. Ballantine Books, N. Y. No. F-602. 1962. 154 pp. 50¢

This is one of a series of novelizations of movie scripts that are bombarding us from all sides these days. From all accounts, the English film on which it is based is a superior job of science-fiction cinema, once you have granted the premise that simultaneous American and Russian H-bomb explosions, one in the north and one in the south, will tilt the Earth's axis and send it into an elliptical orbit, headed for the Sun.

Like the film, the book observes all this from the vantage point of the News Room of the London *Daily Express*. The weather is terrible; odd stories come in from the wire services; the staff of the paper are at first more concerned with their own personal problems than with what is going on, but as the story develops they move into the midst of the holocaust. This is a now-standard picture of society disintegrating under stress—precisely what London did not do under the blitz, and I suppose all the more effective because of the contrast.

For some reason Ballantine did not send this out with its regular science fiction. Perhaps a different department is handling it, and maybe they don't realize it is SF. At any rate, I gather that the film is much better than the book and I am hopefully waiting for a chance to see it. The story is standard cataclysm stuff.

THE DARKNESS BEFORE TOMORROW, by Robert Moore Williams. **THE LADDER IN THE SKY,** by Keith Woodcutt. Ace Books, New York. No. F-141. 113 + 137 pp. 40¢

This Ace Double puts two workmanlike but ordinary variants on familiar formulas back-to-back. "The Darkness Before Tomorrow" is the kindly-aliens-among-us story; "The Ladder in the Sky" is a superman yarn. They are both much better written than such stories were when science fiction was younger, but just about everything in them is completely predictable from having been done over and over through the years.

Williams' story is the better of the two by virtue of having a cou-

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ple of well drawn and interesting characters, Sis Randolph and her brother Eck, who have a chance to operate with some individuality in the very early portions of the book. Scientist George Gillian has stumbled into some shenanigans involving a gangster who has a death-ray, a goat-eyed shadow in a plug hat, and the Randolphs. In these chapters the book goes great guns. Then Ape Abrussi captures and tortures them, they find a mysterious base under a mesa, and things get into the old groove. The fairly portentious gadgetry would do well enough in a so-called SF film, but has no real meaning.

Keith Woodcutt takes us to the future, to the slums of a crumbling society, from which a young man is kidnaped and "sold to the devil in" return for the release of a minor princeling. The prince is released by what looks like magic, and Kazan is promptly fed to the nearest monsters—but he reappears long after and starts building up his supermanship as a bond-slave on a far planet. Here his troubles are as much human as superhuman, since the local administrator has no intention of allowing smarter, stronger men to last long under his command—but the old "magic" comes to the rescue in a somewhat embarrassing way.

The message of all this—and it is the same one that Gordon Dickson uses in his somewhat similar "Necromancer"—is that Man's psi powers have to be forced out of him by great stress, as they appear in spontaneous cases. Once this was a novel idea, I guess; now it's a truism.

THE MATHEMATICAL MAGPIE, Edited by Clifton Fadiman. Simon and Schuster, New York. 1962. 300 pp. $4.95

A magpie—the European variety, at least—is noted for accumulating all sorts of odds and ends in its nest or a hide-away. Only criterion is that they catch the magpie's fancy—and as readers of Mr. Fadiman's earlier collection, "Fantasia Mathematica," know well, that is the unifying factor in this book. That and a sometimes vague mathematical theme.

"Magpie" is an even more indescribable and unpredictable collection than "Fantasia." There are cartoons, verse, anecdotes, bits of essays, artistic decorations. There are several short stories, the opening group unashamedly science fiction but probably quite familiar to the weathered fan. Here, by the way, Mr. Fadiman makes his one evident blunder when he identifies James Blish—represented by "FYI," a cosmic fantasy rather than science fiction—as an English author "who at his best is as good as any of our home products." As company, this wholly American "product" has two stories by the really English Arthur C. Clarke and others by Isaac Asimov, Mark Clifton, Dr. Miles J. Breuer, H. Nearing Jr., William Hazlett Upson, Robert M. Coates and Richard Hughes. Later in the book Robert Graves, Ben Ames

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Williams, H. Allen Smith, Bertrand Russell and Lewis Carroll make contributions, and there is a nice little detective story by John Reese that uses elementary Boolean algebra to break down a set of alibis.

Dig mathematics or not, I don't see how you can fail to enjoy parts of "Magpie" while real math-eaters like the anthologist will savor it all.

RETURN TO OTHERNESS, by Henry Kuttner. Ballantine Books, N.Y. No. F-619. 240 pp. 50¢

By this time the best stories that the late Henry Kuttner wrote under various pen names have been reprinted and re-reprinted until their originality and style are becoming dulled by over-familiarity. Still, new readers can certainly find few better SF writers to meet for the first time.

Of the eight stories collected here, one is a "Hogben" story about the outrageously mutant mountain family who, in this adventure, are tricked into duplicating a nasty neighbor who wants a crack at everyone in the world. The next two are "Gallagher" stories, the opening one in which this subconscious genius and his narcissist robot, Joe, are introduced, and a second adventure in which Gallagher sobers up to find that a new machine is eating the back yard and singing "Saint James Infirmary." Gallagher, in case you've escaped meeting him, works marvels when drunk but doesn't know why or what he has been doing when he sobers up.

"This Is the House" is another, and early, variant on the automatic house theme, quite unlike any of the better known yarns that were in some cases its imitators. "The Ego Machine" is another comedy, in which a robot from the future changes our hero's personality around quite inopportunely. "Android" is a straight plot and action story: problem, how to cope with the discovery that androids are replacing people in positions of power. "The Sky is Falling" is a very minor one about an attempt to prevent an exploring expedition to go home from Mars. And finally "Juke Box" is another robotically humorous offering in which a hapless hero has a juke box in love with him.

If the title means that present-day science fiction could do with more of the "otherness" that it had when Henry Kuttner was writing for this and other magazines, it's particularly apt.

ELLISON WONDERLAND, by Harlan Ellison. Paperback Library, New York. No. 52-149. 191 pp. 50¢

As I've said before, Harlan Ellison is far better at short stories than in longer format, and here he is in his finest form with sixteen stories from just about everywhere. Most could be called science fiction; a few are outright fantasy, what with gnomes and demons running around. All have the peculiar Ellisonian intensity that is partly a reflection of his own personality and partly a hard-earned knowledge of how to make a story move hard and fast, however much light

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may shine through the joints as it passes you.

A knife-edged—and sometimes saw-edged—humor is the predominant tone of most of the stories. There are snappers at the ends, and snappers darting at you from dark corners all the way through some of the yarns. Most of the people and things are very much the products of our times and Time—nervous, in every sense. Heroes are victims of the universe, their society, and themselves but they never give up and go down kicking and screaming defiance. Bits of detail, used for shock effect, have that effect even though they may not stand up too well to dull logical analysis.

I suspect that a careful analyst could tear these stories to shreds without ever discovering what gives them their character and appeal. The bloody bits would bear no resemblence at all to the original chip-on-the-shoulder yarns you'll find here.

PAPERBACK REPRINTS

EIGHT KEYS TO EDEN, by Mark Clifton. Ballantine Books, N.Y. No. F-639. 166 pp. 50¢

The original edition—1960—was not one of the author's best jobs.

THE SUPERNATURAL READER, edited by Groff Conklin. Collier Books, N.Y. No. AS-392X. 352 pp. 95¢

A collection—twenty-seven stories—good enough to let us forget the usual ban on fantasy here. Anyway, some of the stories came from *Unknown Worlds.*

BETWEEN PLANETS, by Robert A. Heinlein. Charles Scribner's Sons, N.Y. No. SL-67. 222 pp. $1.45

One of a new line of paperbacks for young people—a reprint of one of the Scribner series of Heinlein "juveniles" that many people have missed, to their own loss.

THE HOUSE OF THE BORDERLAND, by William Hope Hodgson. Ace Books, N.Y. No. D-553. 159 pp. 35¢

A strange classic from 1908, fantasy rather than science fiction even in that era.

ANALOGUE MEN, by Damon Knight. Berkley Books, N.Y. F-647. 160 pp. 50¢

Last time it was called "Hell's Pavement."

THE BIG BALL OF WAX, by Shepherd Mead. Avon Books, N.Y. G-1129. 159 pp. 50¢

Another edition of the comedy of advertising and evangelism.

AGENT OF VEGA, by James H. Schmitz. Permabooks, N.Y. No. M-4242. 185 pp. 35¢

Rare entertainment and action that started right here in these pages. Gnome published the hardback edition in 1960.

TIME IS THE SIMPLEST THING, by Clifford D. Simak. Crest Books, Greenwich, Conn. No. d-547. 192 pp. 50¢

Last year's novel.

THE INVISIBLE MAN and THE WAR OF THE WORLDS, by H. G. Wells. Washington Square Press, N.Y. W-276. 329 pp. 45¢

Can there be anyone who hasn't read these classics? Arthur C. Clarke adds a special introduction. ■

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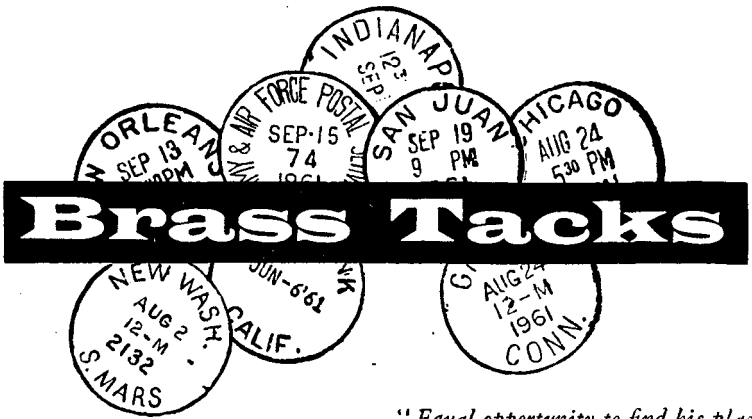

Brass Tacks

Dear Mr. Campbell:

In your editorial for June you claimed that the basis of the United Nations, that all nations are equal, was a fantasy. In regard to every nation being equal in strength, et cetera, this is true. But the United Nations was not created on this basis. It was created on the basis that every nation has certain rights arising out of being a nation. Among these are sovereignty without fear of aggression, freedom from domination by other stronger nations—imperialism, and so forth.

We might compare the UN somewhat to our own Declaration of Independence. It states that all men were created equal. Here, again, it does not mean that all men were created equal in strength, in mentality, et cetera, but that each man was created with the right to an equal opportunity to find his place in society.—Charles J. Peterson, Yakima, Washington.

"Equal opportunity to find his place in Society" IS NOT the right to equal place in Society—which is what the Equalists demand.

Among nations, "domination by other nations" is dangerously difficult to define in terms satisfactory to the primitive—let's NOT be euphemistic—nations. Switzerland— Iceland—Denmark are small; it isn't size alone! The Congo is larger and more populous. But it is NOT in the same class.

« « «

Dear John:

After reading "The Fourth Law of Motion," I had some thoughts on Dean Drives that might make it possible for readers interested in experimenting with them but discouraged by the cost and complexity of the original to have some fun. The trick is in that bar Dr. Davis talks about to illustrate surge effects.

When you apply a force to the

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end of the bar, it doesn't obey F = ma until the push gets to the end of the bar and back, traveling at the speed of sound in the material. This depends on how long the bar is. So if you're quick enough, the bar need never obey F = ma at all.

Now suppose you sink a pin in the middle of the bar and push on the pin. It only takes half as long before the bar obeys F = ma. With the same force applied to the end and the opposite force applied to the middle, there will be a net unidirectional acceleration. These forces could be applied with a pair of solenoids in the following way.

Two solenoids mounted on the ends of a bar facing each other and hooked up in series exert equal, oppositely directed forces at precisely the same time. Since the solenoids are mounted at both ends of the bar, the mass they "see" acting on the bar that hooks them together is the same no matter what it is.

So suppose two solenoids mounted at the ends of a bar push on two pins, one mounted in the middle of a second, longer bar, and the other mounted near one end of the second bar. If they are energized for a short time, long enough for the push to go from the middle to the end and back, but not long enough for the other push to go from one end to the other and back, there should be a slight unidirectional acceleration of the longer bar. The whole business, suspended by a pair of strings could be seen to twitch.

It would be easy to get a short pulse like this by mounting a rotating metal brush so that it comes in contact with a metal plate during part of its circle. The hardest part of this is getting a pair of matched solenoids, but any rough pair that can be got into can be trimmed up by lifting a turn or two from one.

Simple, huh? and cheap.

The books I looked in, by the way, don't seem to realize this business about the "starting transient" in mechanics—Goldstein, "Classical Mechanics" pp. 4 & 5—but think F always = ma. Dr. Davis seems to have come up with something.—Theophilus Daly, 1234 Commonwealth Avenue, Boston 34, Massachusetts.

It is highly improbable that Dean's drive is the best possible way of applying the third-derivative forces, simply on historical grounds. It was a proof-of-principle device—a unique and important First. But it probably is about as crude and primitive as the

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Wright's first plane, or Dr. Goddards' first liquid-fuel rockets.

Whether your proposed gadget would work or not is open only to experimental check—but there should be a million variant forms of inertia drives!

» » »

Dear Mr. Campbell:

For a long time I have observed that all books about "philosophy of science" actually refer to physics. Likewise, most general histories of science are about physics. Since these are usually very poor, I don't mind. However, when your editorials attribute to "science" the sins of physics, I must, as an open-minded biochemical geneticist, object.

In the past few months I have read an article announcing an enzyme which is carbohydrate in nature rather than protein. Likewise, at the last A.C.S. meeting, one chemist announced an anti-ATP factor stable at 550° C. Both of these concepts are enough to make a biochemist's hair curl. They will not be accepted unless confirmed, but my point is that they were published in respectable media and the authors are not now pariahs. If any novel fact in the fields I am familiar with is not investigated, it is mainly because everyone is too busy investigating others.

The physicists may deserve censure. Heaven knows, I don't know what they are doing and can't understand the little I do see. However science as a whole embraces many more fields, most of them as receptive as a baby in a candy store.—S. W. Bowne, 3329 Homecroft Drive, Columbus 24, Ohio.

The more the workers in a field have the feeling "There's very little we do know, and an enormous lot we don't know," the more open-minded they are! Your protest is valid; my apologies to those Scientists who don't know it all already!

» » »

Dear John:

Your editorials are always informative, but the one in the September 1962 issue has left me agog. I'm afraid the advances in modern technology have gotten ahead of me. You casually mention devices and machines I never heard of, tossing them off as if they were old hat, overwhelming me in my ignorance.

I refer specifically to the statement on page 178, paragraph 2, as follows:

"Any astronaut caught off Earth in a modern space capsule [during the time of a solar flare] . . . will be as dead as if he had taken a swim in one of those swimming-pool tractors."

Now, portable swimming pools have been with us for some years; they are usually inflatable structures, made of vinyl or some such tough, flexible polymer, which, when inflated, form a retaining wall which will hold water. They are not really

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swimming pools, but wading-and-splashing pools.

But the notion of a swimming-pool tractor implies something larger and more massive than these. One envisions a huge, Diesel-powered prime mover pulling along a steel or concrete pool no less than 12X15X8 feet.

Are they simply used by swimming-pool contractors to take the finished product from the factory to the excavation they have dug for their customer? Or do they go from neighborhood to neighborhood in the large cities, like an ice-cream truck, to give the kiddies a cooling swim in the summer heat without the inconvenience of going to the beach?

But wait. The sentence implies that our hapless astronaut goes swimming *in the tractor itself!* And, furthermore, that such activity is invariably fatal. Where does he swim in the tractor? In the fuel tank? This implies a much larger machine than I had thought at first. Granted, our spaceman would sink like a stone in such low-density fluids as gasoline or Diesel oil, to say nothing of being overwhelmed by the fumes, but if he were wearing a proper spacesuit he should be able to survive.

Or are you implying that the tractor *beam,* such as that envisioned by the great Dr. E. E. Smith, has been invented? But why should it be called, specifically, a *swimming-pool* tractor? Ah! The light begins to dawn!

Obviously, it is called that because the attractive force of the beam acts *only* upon molecules of H_2O! The picture becomes clear.

A globe of water, let us say, or a piece of ice being lifted by such a tractor beam, would appear to float upward, thereby giving the impression that one could "swim" upwards toward the projector of the beam. Our witless astronaut decides such sport would be fun and steps into the path of the beam. Immediately, every molecule of water in his body is jerked out of it, leaving behind nothing but a dessicated mummy.

At last the analogy is clear. All it takes is a little straightforward reasoning.—Randall Garrett.

Tractor—reactor—what difference does it make so long as you're dead?

» » »

Dear Mr. Campbell:

For many months I have been reading your editorials in Analog with the greatest of pleasure. Your diagnosis as to what is wrong with "SCIENCE" definitely hits the nail on the head. Many years ago I wrote an article on Paracelsus in which with a youthful weakness for long words, it was noted that "The apotheosis of the scientist is the death of science and truth must ever play the iconoclast if knowledge is to advance." I respect and applaud your iconoclasm. However, I must say a word for the phlogiston theory which you state was fundamentally wrong on page 176 of the July issue of Analog.

The woeful ignorance of both the phlogistonists and the alchemists has

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too long been the stock-in-trade of those chemistry teachers who bow humbly to the omniscience of "modern science." Actually the phlogiston theory was an excellent attempt to express the facts of energetics and specifically entropy. It is just as incorrect to say that the phlogiston theory was absolutely wrong as to genuflect before the absolute rightness of present theories. Lavoisier's theories put chemistry on a solid materialistic basis and he deserves immense credit as the titan of science who was responsible for modern chemistry. However, even Lavoisier had to let phlogiston go on under the name of the element "calorique."

The idea that phlogiston had a negative weight was never a part of the original phlogiston theory but was dreamed up as a last ditch defense by lesser scientists who wished to give it a specious relation to those things which could be weighed. When iron was oxidized, it gained weight but it still represented a loss of energy in the system. A man can lose appetite after eating and still gain weight. The late Professor Moore of M.I.T. used to say that a great scientific victory also brought with it a great defeat. Phlogiston was eventually justified in thermodynamics and scientists eventually learned that energy losses had to be understood and could be measured even if they could not be weighed.

It is so easy to make fun of the "ignorance" of the phlogistonists and alchemists and it gives us such a fine feeling of superiority and omniscience. The idea of the periodic table and atomic structure could have been easily accepted by alchemists who believed that the elements represented various combinations of the active principal, "sulfur", and the negative principal, "mercury." The early fire element and the alchemist's "sulfur" were also predecessors of phlogiston, free energy, and entropy. We remember these early scientists only by the colorful charlatans and crooks who used their ideas to get rich. One might just as well remember the modern chemist only by the charlatans who sell lotions that will give us perpetual youth. Modern transmutations justify the alchemists, just as thermodynamics justifies the believer in phlogiston. These old theories proved uninteresting and lacked utility at a time when major progress was being made in other directions. They were never wrong nor are the modern theories right. Omniscience in man is a symptom of death no matter how long the burial is deferred.

This is exactly what you are saying. It is my feeling that the study of early theories is a healthy antidote for those who today feel that they have arrived at the truth. Those who know it all are only those poor souls who can no longer learn.—J. Frederic Walker, 820 North Harrison Street, Wilmington, Delaware.

The only thing you can not learn is something you already know—or THINK you "know"!

» » »

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Dear Mr. Campbell:

Though I have enjoyed Mack Reynolds' Africa serials, I feel that there are a few basic misconceptions involved in his standpoint that detract from the merits of his otherwise excellent stories.

In the first place, the idea that the American Negro can play a crucial rôle, *as a Negro,* in the rebirth of Africa assumes that (i) the American Negro intellectual feels such a loyalty and is motivated by it; (ii) Africans in general accept them to an extent greater than other foreigners, e.g. Caucasians or Orientals. Neither of these premises seems to me to be tenable, from my own experience in Africa, as well as in this country. The American Negro intellectual is at best sympathetic to African problems; but I have met few Negroes who would base their desire to help Africa on any grounds of racial loyalty such as appear to motivate Mack Reynolds' characters. As to African acceptance of the American Negro, the image of the West that exists in Africa is primarily Caucasian; as Mennen Williams pointed out after his African tour, the American Negro is often considered an inferior even in Africa, because he is a descendant of the slaves that were shipped out by their forefathers and were treated as inferiors both in Africa and the colonies to which they were sent. Incidentally, the American Negro has developed as a far more distinct racial type from the native African than—say—the American Caucasian from his West European ancestors; he would be easy to identify in any native African group, and so would find it difficult to conceal his identity.

These factors would not totally rule out Negro participation in African development, but they would certainly preclude its having the "crucial rôle" that Reynolds envisages.

Secondly, Reynolds appears to ignore the "educated nucleus"—as Galbraith calls it—which is a phenomenon of underdeveloped societies undergoing rapid change and poses its own special problems. These nucleii are themselves highly educated and strongly motivated in terms of quasi-nationalistic or pan-African goals wherever they appear; I find it difficult to believe that Homer Crawford and his associates would never encounter such people or movements, much less come to terms with them! —Deb Kumar Das, Department of Economics, University of Washington, Seattle 5, Washington.

When experts disagree, it leaves the rest of us guessing! Mack Reynolds spent a number of years in North Africa; he was personally familiar with all the places he discussed in the stories of Al Hassan.

» » »

Dear Mr. Campbell:

I do not know if you have mentioned the impact of small things on life very much. We all know that things we can't see can make us sicker than hell, even dead. Inventions have

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a similar impact, and sometimes not the way it started out to be.

Take the transistor, for one. Notice the increasing number of kids shuffling blankly down the street with a transistor radio glued to one ear, or a wire trailing from an earphone to pocket. The writers who saw a far future where everyone had a brainwashing device on them were too visionary. Here it is already. But it has had effects elsewhere, in the military field, for one.

You have seen pictures of our Brave New Army of 19?? in which a trooper masked against radiation, armored against slugs, and armed with our new rifle which is slowly trickling to the troops, is also fitted with a helmet radio. That is a little way off in the U.S. Army, for reasons of cash, net control, radio discipline, et cetera. When sets are few, chatter is low, when everyone has got one, try and get through to the C.O. quickly—but let's look elsewhere, in other armies.

The transistor has made a diff in guerilla warfare. Some information on the Viet Cong and other Indochinese guerillas mentions use of the standard Japanese commercial receivers for getting instructions from the boss. They are small, reasonably reliable, and many use only the regular flashlight battery. Special batteries needed for the big military sets limited their use by underground nets, but the transistor set can be kept in action with practically no investment of cash, and small bulk of supplies.

Then also, the last French General's revolt foundered for several reasons. One small, but important factor was that they could not count on conscripted units. The draftees had quite a few transistor sets, and they could hear De Gaulle quite clearly. *He* said what they should do, and they did it.

Small inventions do cast large shadows, don't they? Got any other examples?—John P. Conlon, 52 Columbia Street, Newark, Ohio.

Data infiltration—whether subliminal or not—changes attitudes. And attitudes determine motives—

» » »

Dear Mr. Campbell:

Re the Crab Nebula cover—well worth the price, incidentally—maybe we better get with these fallout shelters after all.

If Crab is expanding at 5,000 mps, approximately 1/37 the speed of light, and is 500 l.y. away, it should theoretically blanket the Solar System in only 18,500 years. This occurrence will be especially dangerous and insidious since no one but a scientist will be able to detect it. However, we will all be scientists then, so-o-o—maybe we better get with these fallout shelters after all.—Colin G. Jameson, 1501 Olivia Street, Key West, Florida.

1. *It's five thousand, not five hundred, light years away.*
2. *In 185,000 years we'll be out there anyway—and in 18,500 years too, for that matter.*

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(*Continued from page 82*) cares at least a little about what happens to me."

On her face was a poignant longing for someone to love and comfort her. It seemed to him, now beyond any doubt, that there could never be anything for him in his career but loneliness. How different the warm love of Lyla would be from the cold austerity of the military and its endless succession of weapons and killing—

He moved, to sit beside her and put his arm around her shoulders. "Lyla," he said, "I want to tell you—"

"*Dale . . .*" The word was a despairing sob as her composure broke and she held tightly to him, crying, her voice coming muffled as she pressed her face against his chest. "Help me, Dale! How can I marry that sadistic beast when it's someone else I can't live without—and he doesn't even know I love him!"

"But he does!" He hugged her closer, "He does know, and he loves you even more than you love him."

"Are you sure?" She raised a tear-stained face, hope like sunshine through clouds on it. "Are you really sure Val loves me, after all?"

"*Val?*"

The revelation was like the stunning concussion shock of a blaster beam passing two inches overhead. His vision blurred and there was a hideous roaring in his ears. She was still holding to him for comfort and it seemed to him that was wrong—he should be clinging to her for support . . .

"*Dale . . .* what's the matter?"

"But I thought—" He swallowed with difficulty. "I thought you meant that I was the—"

Something struck the top of his head; this time, for certain, the concussion shock of a blaster beam passing close above it. There was a vicious crack as the beam split the tree beyond, then a crash and explosion of wood fragments as a second beam followed the first.

He rolled from the log, taking Lyla with him. The arrow bushes shielded them briefly, long enough for them to reach the temporary safety of a small swale.

"Dale!" Her dark eyes were wide with puzzled surprise and one small foot was bare from the loss of a sandal. "Someone shot at us!"

He thought, *So Narf got his pictures, after all.*

"Rootenant!" Alonzo came running. "They are *that* way—awr spread out to be sure to kirr you."

Alonzo motioned with his nose, a movement that seemed to cover all the high ground beyond them. At least, the enemy was not between them and camp. Not yet.

A distant shout came, an order from Narf to his men:

"*All of you—down that ridge! Get between Hunter and camp!*"

"*It's him!*" Her fingers gripped his arm. "He wants them to kill you!"

They had fired from a distance

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too great for his own blaster. He could not defy them from where he now stood.

"I'll have to try to get within range of them," he said. "I'll go back—"

"*No!*" Her grip on his arm tightened. "Don't leave me, Dale—don't let him find me here."

He looked down the length of the swale. At its lower end the ghost tree forest began, dense and concealing—but all down the length of the swale the snarevines lay in thick, viciously barbed entanglements, overlying a bed of sharp rocks and boulders. She could never get to the safety of the ghost trees in time.

Narf had his pictures, now. What would he do to her in the insanity of his hatred and triumph when he reached her

"All right, Lyla," he said. "I'll see that you get to the trees—"

There was a crashing of explosions and debris leaped skyward behind them and along both sides of the swale. The firing continued, scattered but very effectively consistent, and he said as he drew his blaster, "I guess they don't want us to go away."

He set the regulator of the blaster at lowest intensity so that the beam would not clip dangerous flying fragments from the boulders. The green, tough vines disintegrated reluctantly while the precious minutes sped by; while the unhindered assassins would be hurrying to the point where the entire swale would be visible to them and under their fire.

Alonzo was following along near the top of the swale's side, ignoring the danger as he watched the progress of the enemy and reported it to Hunter: "Now they are halfway, Rootenant, hurrying faster—"

They reached the lower end of the swale. The last of the vines disintegrated and the ghost tree forest lay before them.

He touched her cheek in farewell. "Get on to camp, as fast as you can run."

The firing abruptly ceased as he spoke. There was an ominous silence. Alonzo came running, his tone almost a yelp in its urgency:

"They are awrmost where they can see us! We got to get her out of here, Rootenant—awrfur quick!"

"*Lyla!*"

It was the voice of Val, sharp with concern for her. He came running out of the ghost trees, all his cold impassiveness gone. "Are you hurt, Honey—are you hurt?"

"*You came for me!*" She whispered the words, her face radiant. Then she ran to meet him, her arms outstretched, crying, "*Val . . . oh, Val . . .*"

Their arms went around each other.

Then the woods erupted as ten blasters laid down a barrage to block any escape to camp.

"I'll try to give you a chance

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to get through," Hunter said quickly. "Be ready for it when it comes."

He ran toward the firing line, taking advantage of the concealment afforded by the first fringe of ghost trees. They should be almost within range of his own weapon, now—

Again, the firing abruptly ceased, as though by some signal. There came the furious raving of Narf: "*It's that Boran she wants! Kill him, too!*"

Sonig cursed with bitter rage. "*Jardeen is lost to Verdam if any witness escapes—and we'll all hang, besides.*"

There was a second of silence, and then Narf's command: "*Kill the woman, too!*"

There was a roar like thunder as the firing began. The ground trembled and debris filled the air with flying fragments. Hunter, still running toward the enemy under cover of the trees, saw Val trying to get Lyla to safety and saw them both hurled to the ground as a tree exploded in front of them. They would never live to rise and run again—

He saw Rockford's plan, at last, and what his own duty would now have to be. He knew why Rockford had said of this day, "*If you can live through it, you will have it made.*"

And he had a cold feeling inside him that he was not going to have it made.

He took a deep breath and ran toward the enemy, out of the concealment of the ghost trees and in the open where they could not fail to see him, his blaster firing a continuous beam that fell only a little short of the enemy, that showed them he would be close enough to kill them within seconds if he was not stopped.

The fire concentrated upon him, giving Lyla and Val their chance for escape. He ran through an inferno of crashing explosions, twisting and dodging on ground that trembled and heaved under his feet, while razor-sharp rock shrapnel filled the air with shrill, deadly screaming sounds.

Something ripped through his shoulder, to spin him around and send him rolling. He scrambled up, firing as he did so, and ran drunkenly on.

Something struck the side of his head and he went down again. He tried to rise and fell back, a blackness sweeping over him that he could not hold away despite his efforts to do so.

It seemed to him that the firing had suddenly stopped, that in its place was the hoarse buzz of a police stun-beam. It seemed he saw helicopters overhead, bearing the bright blue insignia of the Royal Guard and then there was nothing but the blackness.

There was a brief, dreamlike return to consciousness. He was in a Royal Guard helicopter and Alonzo was beside him, grinning,

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and saying, "You be O.K.—I grad! And my Princess Ryra—rook at her now, Rootenant!"

He saw Lyla, her hand in Val's, and her face was glowing and beautiful in its new-found happiness. Then she was bending down, kissing him, and saying, "Dale . . . Dale . . . how can we ever thank you for what you did?"

When the blackness lifted the second time he was lying, bandaged, on a cot in the meeting hall and the voice of Rockford was saying, ". . . Ready to go in just a minute."

The hall was filled with members of the royal court who had come for the wedding. He saw the white robes of Church of Vesta dignitaries who had come to officiate at the wedding. Then he saw the seven grim old men seated at the far end of the table.

The Royal Council—with the judicial power to give even death sentences in crimes committed against royalty.

Sonig, his face white and staring, was being half led, half carried, away from them.

Narf, in the grip of another Guardsman, was standing before the Council and saying in a tone both incredulous and sneering:

"Is that my sentence?"

"There is a qualification to it," one of the Council said. "It seems only just, in view of your crime, that you be tortured until death—"

The rest of the words were lost as the blackness swept back. But before unconsciousness was complete, when all else in the hall was gone from him, he heard Narf's cry; an animal-like bawl of protest, raw and hoarse with anguish . . .

"Ah . . . you're coming out of it, my boy."

Rockford was standing over him. "They gave you a Restoration shot on Vesta forty-eight hours ago. It will be wearing off in a minute and your head will clear."

He sat up, and the dizziness faded swiftly away. He saw that he was in the compartment of an interstellar ship and he knew that it was Earthbound.

And that Vesta, and brown-eyed Lyla, were now part of the past . . .

"Don't look so sad, my boy," Rockford said. "You'll get due credit and promotion for the invaluable part you played in my plan."

"But—"

"I know. But she was never yours. You'll find life is full of heartbreaks like that, son.

"And we accomplished our mission. Narf's crime neatly invalidated the proxy marriage. Then Lyla set a new precedent by marrying Val that very day. Earth has never had two such loyal and grateful friends as Val and Lyla."

"You knew all about them, didn't you?" he asked.

"Strategic Service has to know everything. And I knew they were

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still in love even though each was too proud to admit it. That's why I had to insist on Val coming to Vesta. After that, it was only a matter of using you to awaken Val to the fact that she did *not* love Narf. And of taking care of various little details, such as faking an official request for the helicopters to come out two hours ahead of time, getting Val off to find her at the proper time, and so on."

Rockford smiled at him, "And you learned that an old man's mind can be mightier than the space fleets of the Verdam empire—and that the line of duty that produces the best results can sometimes be very devious."

He thought of the white-faced Sonig, and the anguished bawl he had heard from Narf.

"I suppose they were going to hang Narf and Sonig at once."

"The Council would have, no doubt. But Lyla was so happy that she begged the Council to give them very light sentences—or just let them go free. So I suggested a compromise. The Royal Council regarded it as very fitting."

"What was it?"

'For Sonig, no punishment. The murder attempt, being news of public interest, will be broadcast upon Vesta and other worlds, including a factual, unbiased account of Sonig's participation in it. Shortly afterward, Sonig will be taken to Verdam and turned over to his own benevolent government. Vesta will file no charges."

"But Sonig lost Jardeen for his government. They'll execute him for that!"

"Yes. I'm afraid so. Shall we call it poetic justice?"

"What about Narf?"

"His sentence was life-long exile on his Sea Island estate. He will be provided with all the luxuries to which he has been accustomed, including a full staff of servants. He will continue to enjoy all his possessions there, including his gallery of nude paintings, his risqué films, his pornographic library, and so on. In fact, since he is so fascinated by pornography and such a collector thereof, any pornographic material which might become available on Vesta in the future will be sent to him."

"That's not right . . . I mean, they were going to torture him to death."

"Not 'to death'. It was 'until death'. There's a difference."

"But that bawling noise he made—"

"Ah . . . that was due to the one restrictive qualification to the benign terms of his exile. Every woman on his estate was to be removed before he reached there, leaving men servants only. Patrol boats will see to it that for so long as he lives no woman shall ever set foot on the Sea Islands."

Rockford smiled again. "Lord Narf succeeded beyond his wildest dreams in keeping his boyhood vow of being always a man among men." ■

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(*Continued from page 5*) a pure Mathematician, like a fiction author, is free to define and describe any Universe of Discourse he chooses. So long as his Universe of Discourse is self-consistent, the fact that it bears no relationship whatever to the real universe we live in has nothing to do with the matter. It may be a magnificent exercise in pure imaginative logic, a thing as fine, in its way, as any other finely done art-form.

Euclid's plane geometry does not fit any real-world system that we know of; the Earth is a sphere, and we have reason to believe that the Universe itself is curved. None the less, Euclid's geometry is a magnificent work of pure abstract reasoning. It is *valid;* it just happens that it is not *true*, which is a quite different thing altogether.

Hal Clement drew a very nice map of the geography of the planet Mesklin; his story "Mission of Gravity" was laid on that map. The fact that no such planet exists, that no real world corresponds with that map, in no way interferes with the complete validity of the story as a work of art.

If it is conclusively proven that the planet 61 Cygni C— which Clement suggested was Mesklin— does not in fact have any of the characteristics he attributed to it— the validity of his story "Mission of Gravity" as a work of art is totally unimpaired.

The Mystic, the pure Mathematician—these men can work, and work under rigorous self-discipline, yet their work is not to be considered Science, *because it is not subject to the test of real-world experiment.*

It is in this sense that Einstein, *as himself alone*, was not a Scientist, but a Philosopher-Mystic. He did not himself test his theories.

However, because he did accept the results of experimental tests performed by other men, he showed the basic attitudes of the true Scientist. Unlike a Greek Philosopher, who would have spurned as unmannerly, the very suggestion of submitting his high and noble Ideas to dirty materialistic experimental test, Einstein showed the true Scientist attitude—he valued the results of test procedures.

Note that Einstein was unlike Newton or Galileo, for instance, in that both Newton and Galileo *were themselves experimentalists of the highest order*, as well as being top-order theoreticians. Newton slipped in believing that no achromatic lens could be made for telescopes—but he worked out the theory of the reflecting telescope, and then worked out practicable techniques for grinding his mirrors, and built functioning reflector telescopes. Newton-alone constituted a full Scientist; Einstein-alone did not—but was, because he had the attitude of allowing his ideas to be challenged by experiment, capable of being a great Science worker.

Returning to the discussion of the Scientific Method again:

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5. The new theory will be used until such time as it fails in a crucial experiment—when it incorrectly predicts the results of an experimental procedure.
6. At this point, whether a new theory has already been developed or not, the existent theory must be classed as "Known to be inaccurate; usable within certain limits. New theory needed." And a search for a new theory *must be instituted.*
7. The new theory means simply that a new hypothesis is introduced . . . and we begin with Step 1 again.

Properly, as Dr. Davis said in his "Fourth Law" article, Science is a series of successive approximations, each of which must be *valid*, but *none of which will ever be true.* Because, to be completely true, a theory must explain everything in the total universe with perfect accuracy. The Solar System is now 5,000,000,000 years old, and there's every indication that it is good for approximately another 10,000,000,000 years minimum. The idea that we who have evolved as self-motivating intelligences only about 2,000,000 years ago can conceive of the total possibilities of the total universe is the most incredible proposition that has ever been presented. To suggest that Modern Science can explain everything that really can happen is several steps less sane—less rational —than the Revealed Religions which claim the final answer to all possible problems of the Universe. They are at least frankly mystic in nature!

The difficulty is that when Science comes to the point of Step 6—when they realize that their best theory doesn't cover the problem, and a new one must be devised—they act like some of the sailors of Columbus' time. They've come to the Edge of the Ocean, and refuse to go further, because they know they'll sail off over the Edge. They lack the courage to explore into the complete Unknown. The tendency at that point is to make a sharp right-angle turn, and go somewhere else, denying that anything whatever exists out in *that* direction!

Now I hold that a man has a perfect right to refuse to be an explorer. There's no reason why I, for instance, should be commanded or driven to explore Amazonian jungle swamps; personally I hate that sort of work, while I know there are many who love it. There is no reason why any man should be forced to explore a newly discovered cave; maybe he has acute claustrophobia, and the job is utterly unsuitable to his basic psychology.

If a good and useful Scientist doesn't want to explore beyond some Edge—we can take a good, hot controversial one like psionics, for instance!—there is no reason why he should be forced to.

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But . . . does he have any right, because *he* has claustrophobia to do everything in his power to keep *me* from being a spelunker, and exploring some newly discovered and fascinating-to-me cave?

Does *he* have any right to stir up a mob of the local citizenry to arrange a lynching for me, or anyone else, who chooses to explore beyond the Edge of the Unknown?

Does he or anyone else have a right, because he doesn't like the thought of What Lies Beyond, to take measures to have me blackballed, my credit at the bank cut off, the butcher, the baker, and the instrument maker turned against me so that I *can't* continue with my exploring?

There are three main divisions of attitudes that men can have toward a project—three easily definable points on a spectrum of attitudes.

1. "Anyone who even thinks of anything of that sort is clearly insane, and should be stopped for his own good, and certainly prevented from affecting anyone else with his nonsense."
2. "I don't see much point in wasting time and money on that project, but I suppose he can if he wants to."
3. "Anyone with good sense will see at once the immense importance of joining in the great effort to achieve this important goal."

When I was at M.I.T. in 1930, if some student had stated his intention to do graduate work on exploring the possibilities in solid-fuel rocket propellants, and specified that he did *not* mean to work for a fireworks company, he would have been strongly discouraged by the faculty. Waste of time—nonsense—no place for such misguided and useless things . . .

In 1945, the attitude would have been more on the order of #2 above. The V-2's, after all, had shown that *liquid* fuels were the answer, but if someone wanted to spend his time and effort on solid fuels . . . well . . . he'll learn something about combustion chemistry anyway, that may be useful . . .

By 1960, the attitude was still further toward #3; the Polaris and Minuteman had shown the importance of developing good, high specific-impulse solid fuels.

Now notice that *either attitude #1 or attitude #3* is not in keeping with the Scientific Method—with a true Scientific Attitude! Each says, one way or the other, "We know what the Right Answers are!" More specifically—we know where the Right Answer Limits are.

My objection to the Orthodox Science system now dominating American Science is that it is displaying almost purely the attitudes #1 and #3.

I am not demanding that Science immediately drop what they're doing and investigate psionics—but that they get the hell out of the way

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and let someone who wants to try have a chance to do so! That they stop rousing the citizenry to constitute a massive opposition to any investigation of the field—that they stop pontificating that "anyone who becomes interested in such things must, obviously, be irrational, and someone should take over his affairs, a guardian should be appointed."

Thirty years ago, the oppressive resistance to study of spaceflight, rocketry, and commercial application of nuclear energies was on about the same level. "You can't build steam engines until it's steam-engine time," is true quite largely because you tend to get lynched for trying to do so, not because it couldn't be done!

I object to being told that I should immediately cease and desist from looking with interest over the Edge of the Unknown, and at once turn my efforts to promoting the Important Things that Science is Doing.

Somehow I've always been uncomfortable riding on the bandwagon; the noise hurts my ears or something. It's quite true that it's a lot easier to support the Cause That's Already Won . . . but some, like myself, find it less challenging. Kind of like "going hunting" in a game preserve, where they've got tame deer that stand around waiting to be shot.

The causes that have already won don't need services, I feel . . . so why bother? In the '30s, rocketry needed some encouragement—the idea that atomic power *could* be harnessed, and in the immediate future needed support.

Now there are other things that need support—and are the proper field of science-fiction speculation.

And I strongly resent the anti-scientific attitude of Professional Scientists who try to tell me—and through me, you readers—that we *must* concentrate on what *they* think is important, and must immediately stop this nonsense of peering over the Edge of the Unknown. That cave-exploring is obviously insane, because *they* have claustrophobia and go into screaming panic if caught in a cave.

Again, currently it is held that computers hold the future of control-system development. Maybe . . . maybe not. Did you read recently where someone's found a system for training pigeons to act as small-parts inspectors on an assembly line? They're trained to peck at button A if the part is satisfactory, and to peck at B if the part is bad. Watch a pigeon inspecting seeds scattered among sand and gravel, and with perfect accuracy selecting and rejecting—and you'll realize that they have been evolved as natural-hatched small-parts inspectors! They can recognize a food-particle in any orientation, and selectively reject closely similar sand and gravel.

As of just now, we couldn't build a computer that can do that; if we could, it'd probably run to several

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hundred thousand dollars cost to manufacture. On top of which, the service reliability of a computer that complex would probably give us down-time amounting to half the operating time.

We can grow a pigeon's brain—which is inexpressably more "sophisticated" than any computer yet built—for 50¢, and it's reliable for periods of several years and self-repairing at that!

During WWII it was demonstrated that pigeons could be trained to peck at a target-grid on which was optically projected the scene below a falling bomb, and direct the bomb to a selected target—a ship at sea—with an accuracy of 98% or better.

For all I know, those highly successful Russian Moon rockets may have had far, far more sophisticated guidance-control systems than any of the American probes. A pigeon's built-in computer is specifically evolved to solve, almost instantaneously, problems of three-dimensional aerodynamic flight-paths. They ought to make damn good Moon-probe pilots, with a little training—with a reliability rating far and away higher than anything man-made, and about equally far ahead in microminiaturization and reliability.

Why should our thinking be confined to electronic computer methods? Biological computers are already available, enormously cheaper, more compact, more reliable, and . . . but we can't think in those terms, though, because everybody *knows* living things aren't to be trusted. They aren't *machines*.

So they aren't. So they repair themselves, and have higher reliability in function . . . if they're properly conditioned.

Certainly the Russians have *something* more reliable and accurate in control-system mechanisms than we have!

As I say . . . for all I know, it may have been a pigeon that so neatly piloted that Russian space probe out around the Moon and back in close to Earth for transmission of the pictures that were obtained.

One of the major objections the unscientific Scientists raise to things like psi, or the Dean device, is that "there is no theory—no way to analyze the problem!"

So what the hell! I thought part of a scientist's job was developing theories to explain observed facts—that he had duties, as a scientist, beyond mere using theories that had been handed to him! Agreed; there is no theory. And there was no theory of why Kepler's Laws of Planetary Motion worked, either—until Newton went to work and intuited one. And it was that that we recognize as Newton's great work—the fact that he invented a theory where none existed before.

Take those dowsing rods, for example. Romans used them; modern utilities company engineers use them. Scientists deny they exist

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at all . . . because they have no theory. And they never, never will have . . . until someone is willing to be a ***real*** Scientist and do the Newton-type job of *inventing* a theory. Remember that Step #1 in the scientific method involves setting up a postulate—that without that step, no other step can be taken.

There's another objection Professional Scientists have; that a given set of facts may be explained by a dozen different theories. To be a good theory, a suggested theory must not only explain all the relevant acts, but must "make sense," as George Gamow put it.

Yeah . . . fine. Only now define what "make sense" means! Turns out it really means "agree with what I now believe is the right kind of answer."

Let's take an example that will make that clear: A South American Indian witch doctor has observed that a stew made from the bark of the *cinchona* tree will break up the fevers of his malaria patients. This is simply an observational fact—like observing that magnetized iron tends to align itself north and south, or that British sailors supplied with a daily ration of lime juice, for reasons unknown and unexplained, don't come down with scurvy.

So two theories are offered to explain this phenomenon. Theory #1 holds that malaria is caused by little animals, too small to be seen, which get in the blood, and start eating it, and this makes the patient sick, and he gets fevers. The bark of the *cinchona* tree contains a substance we'll call quinine which is a specific poison for these little animals too small to be seen, which kills them, but not the patient.

Theory #2 holds that the fever is caused by the fact that a demon from Hell has possessed the patient, and, as everyone knows, Hell is hot, so naturally the demon makes the patient hot. And sometimes the demon gets a particularly strong hold on the patient, he gets especially hot, and starts raving and attacking his friends.

Now the *cinchona* tree is a very holy tree, and has a Good Spirit, which is constantly reaching upward to God's sunlight, and in the bark is the essence of that Good Spirit. The power of the Good Spirit of the *cinchona* tree is such that it can drive out the demon, and so the fever is broken and the patient is cured.

Now . . . which theory best explains the observed facts, and makes most sense?

Why . . . certainly not that utterly insane idea about animals too small to see! And who ever heard of a poison that would poison animals and not poison men? Everyone knows that any effective poison, like curare for arrows, kills men and animals alike—that any food that animals eat, men can eat if they want to. Clearly such a theory makes no sense at all.

Besides, if I were brought up

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believing in demons and spirits, theory #2 makes lots of good sense. Obviously a sound and scholarly analysis of the problem. It explains clearly why it is that when the patient gets hottest, he behaves most irrationally, too.

Of course, if I was brought up believing in animals too small to see, and highly specific toxins, what "makes sense" would look a lot different.

The trouble is . . . both "make sense" tests are equally subjective, not objective.

Is the "makes sense" test a Scientific Method test . . . or does it belong in straight Mysticism?

The very basis of the Scientific Method is that *no subjective evaluation shall be allowed to determine truth.*

The "makes sense" test is a subjective test—and to hold it as a proper test for a theory is *not* a scientific approach; it's a proper Mystic approach.

To deny objective, pragmatic evidence because "that can't be true—it doesn't make sense!" is to rely on the ancient Mystic approach, to retreat to the Greek philosophers of Athens, who abhorred experiment, and utterly rejected the idea that Man's Noblest Ideas should be submitted to the judgment of mere physical experimental evidence.

Truth is not obligated to "make sense"—i.e., to agree with your personal-cultural orientations. But to claim that you are a Scientist, you are obligated to have your ideas of "sense" agree with Truth.

Anyone who says he is a Scientist, and rejects observational data on the basis that "it doesn't make sense" is like that fifth leg on a dog.

Saying he is one doesn't make him one. No matter who says he is!

Any "Science" that follows the antiscience attitude that only those things which "make sense" in its terms is operating under false pretenses.

I'm not attacking Science—I'm attacking the fraudulent pseudo-scientists who reject the hard, harsh discipline of the Scientific Method—that any theory must yield to pragmatic fact—and yet claim the name of Science.

Anyone who holds that a fact must "make sense" in his terms before it can *be* a fact is a pseudo-scientist, and I have every right to attack his misappropriation of that title. The fact that he has umpteen degrees in different Science fields, from x different highly respected Universities has nothing whatever to do with the matter; a Mathematician is not a scientist, and is honest enough to acknowledge that fact.

The trouble comes from the man who has degrees in Science, but holds the Mystic attitude that facts must submit to theory, while claiming to have the Scientific attitude.

That fraud, gentlemen, is my target!

The Editor.

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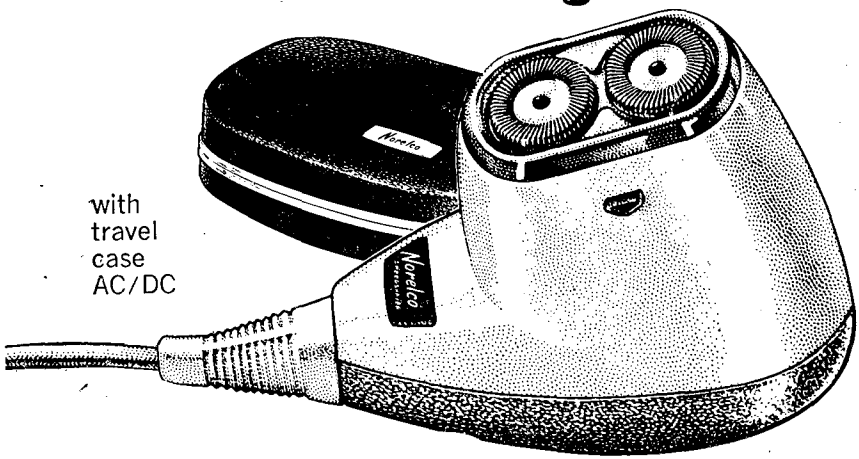

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